

SCIENCE

FRIDAY, DECEMBER 14, 1888.

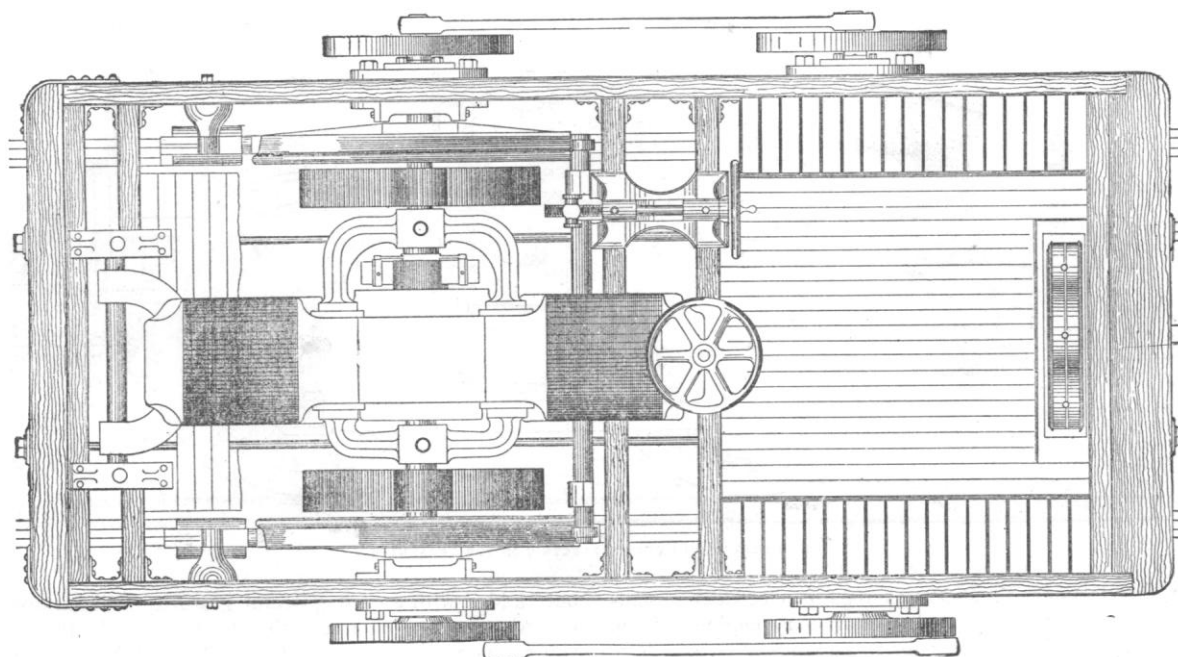
ELECTRIC PROPULSION.

Nov. 26 and Dec. 5 of the current year will be memorable dates in the history of electric propulsion; for on those days the largest and most powerful electric railway-motor yet constructed gave proof, on the Ninth Avenue line of the New York elevated railways, of its capability to do all that the steam-locomotives there in use are called upon to perform in their regular service. This motor was the Daft motor 'Benjamin Franklin,' whose plan and side-elevation illustrate this article.

Electrical traction on a minor scale is no new thing: Siemens, at Berlin and Port Rush, had accomplished it as early as 1881, and Daft himself had achieved the first commercial success in this line

The question will naturally suggest itself, 'What future has this motor, and what are its claims to preference over the system now in use on the New York elevated railways?'

The answer is, radical economy, which lies in the recognized wastefulness of small — especially locomotive — engines, and the high efficiency of large stationary engines of improved type. Multiplication of power-generators implies loss in efficiency, and increased cost of attendance. Derivation of power from one origin, with ready capability of subdivision, is economy. The average consumption of coal per horse-power, as between light rapid express and slow heavy freight-trains, is about nine pounds per hour for steam-locomotives. A modern compound condensing engine will yield a horse-power for two pounds per hour, or even less. Admitting that the conversions from power to current, and *vice versa*, consume one-third of this, it still remains that the loco-



PLAN OF DAFT ELECTRIC MOTOR 'FRANKLIN.'

— that is to say, the first electric railway ever built under a business contract, completed and paid for in accordance therewith, and continued in operation without modification thenceforward — at Baltimore in 1885; but nothing excepting the Pittsburgh motors of 35 horse-power, also of Daft's design, had passed the limit of 10 or 15 horse-power until the 'Franklin' appeared on the scene.

A general description of this motor follows; and the cuts will give a clear idea of its mechanical arrangement and details. The total weight is ten tons, — very little over half the weight of the steam-locomotives in regular use, — and the wheel-base and length over all are respectively 5' 6" and 14' 6". The total horse-power is probably 150, although there has as yet been no opportunity of making an ultimate test in this respect.

The 'Franklin' was designed to pull four cars and their seated load — a total weight of 75 tons — over any gradient of the Ninth Avenue Elevated Railway at the schedule speed of ordinary trains. In the trials a train of eight empty cars — a load of 122 tons, 47 in excess of that agreed upon — was taken up the maximum gradient (nearly two per cent) at a speed of 7½ miles per hour, and a loaded four-car train exceeded the schedule speed by almost 3 miles per hour.

tive-engine needs more than three times as much coal as the stationary for every horse-power exerted upon the track. It is demonstrable that the New York elevated railroads can be run at less than half the present cost for motive power, including a charge for interest on the cost of the new equipment, and ignoring the proceeds derivable from the sale of the old.

Other economical features of the system are, —

1. Reduction of attendance.
2. Conservation of permanent way from the diminution in weight of motor permitted by its superior adhesion. This is always available where the rails constitute part of the circuit, and makes plain why the 'Franklin,' of half the weight of a steam-locomotive, can haul as great a load. One of the most invaluable features of the system is the high degree of adhesion between the motor-wheels and the rails, which permits the employment of much lighter tractors than would be practicable if steam-locomotives were used, to the manifest advantage of the vehicles themselves and of the permanent way. This adhesion is not magnetic, and probably results from molecular change produced by the current in contiguous surfaces of wheel and rail. It sometimes amounts to forty per cent of the weight as opposed to twenty per cent usually observable in steam-

locomotives as the average of all conditions of track as affected by weather and use.

3. The possibility of dispensing with the complicated methods of insulation that are necessary and most expensive features of high-potential systems.

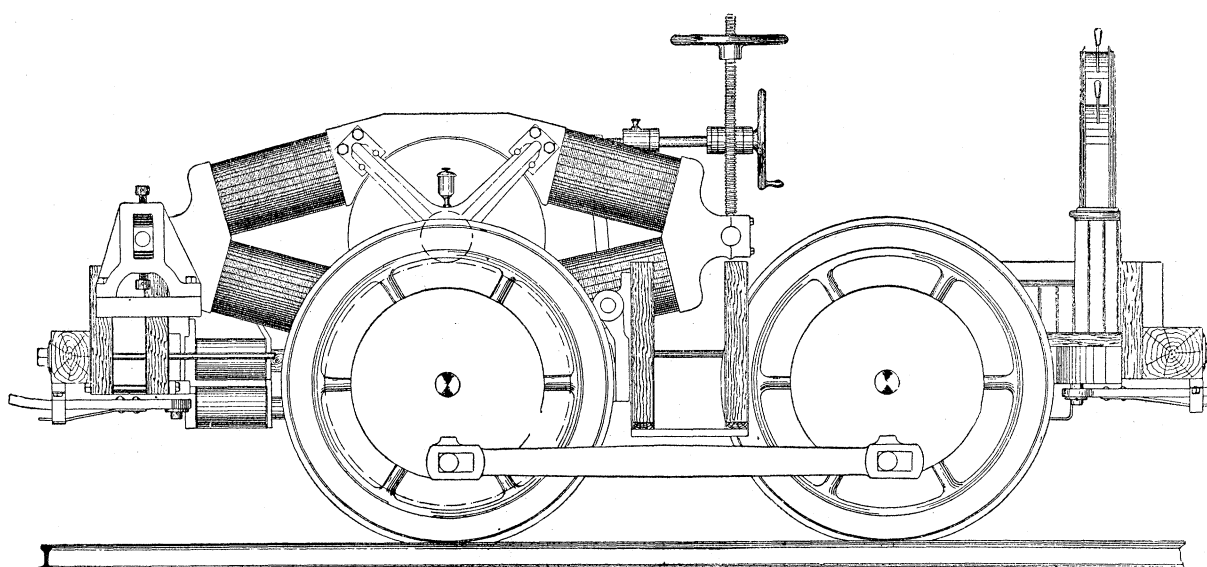
4. A potent cause of the economical working of electric railways is found in the capacity for instantaneous adjustment of the current to demands made upon it. This is so marked in the case of a double-track road with the same number of trains moving in both directions, and all deriving their power from a common generating-station, as to prompt Dr. C. A. Siemens to draw this striking analogy. He declares that two trains on the same track, one descending and the other ascending a gradient, are in as absolute connection by the current in the rails as if tied together by an actual rope. The counter-current generated by the free revolution of the dynamo of the descending train re-enforces the main current, and thus helps the ascending. The result of this is that the maximum capacity of the generating-station need only equal the average work of one motor multiplied by their total number. This will always prove sufficient. Every steam-locomotive must be ready at all times to exert its full power; and the waste of this, in the aggregate, is enormous.

familiar steam-engine, which has profited by eighty years of use, experiment, and analysis by the best human ingenuity.

To resort to generalization, the steam-engine's characteristic function is to transform heat into mechanical work; and the labor and thought of three generations have only succeeded in recovering, in the shape of work, from ten to twenty per cent of the total heat applied to it. The peculiar office of the dynamo-electric machine is the conversion of mechanical work into current electricity; and in the first decade of its useful existence it returns, in the form of electrical current, ninety per cent of the mechanical work applied to it. The adept steam-engine attains one-tenth of its possible efficiency; the tyro dynamo-electric machine, nine-tenths. "If they do these things in a green tree, what shall be done in the dry?"

ELECTRICAL POWER-DISTRIBUTION.

ONE of M. Victor Popp's friends was recently describing with post-prandial eloquence the wonderful system of compressed-air distribution now so extensively operated in Paris. As if it were not marvellous enough to picture to his hearers' minds pneumatic clocks throughout Paris, and all sorts of machinery deriving power from a central station for compressing air, the interesting 'diner-



SIDE-ELEVATION OF DAFT ELECTRIC MOTOR 'FRANKLIN.'

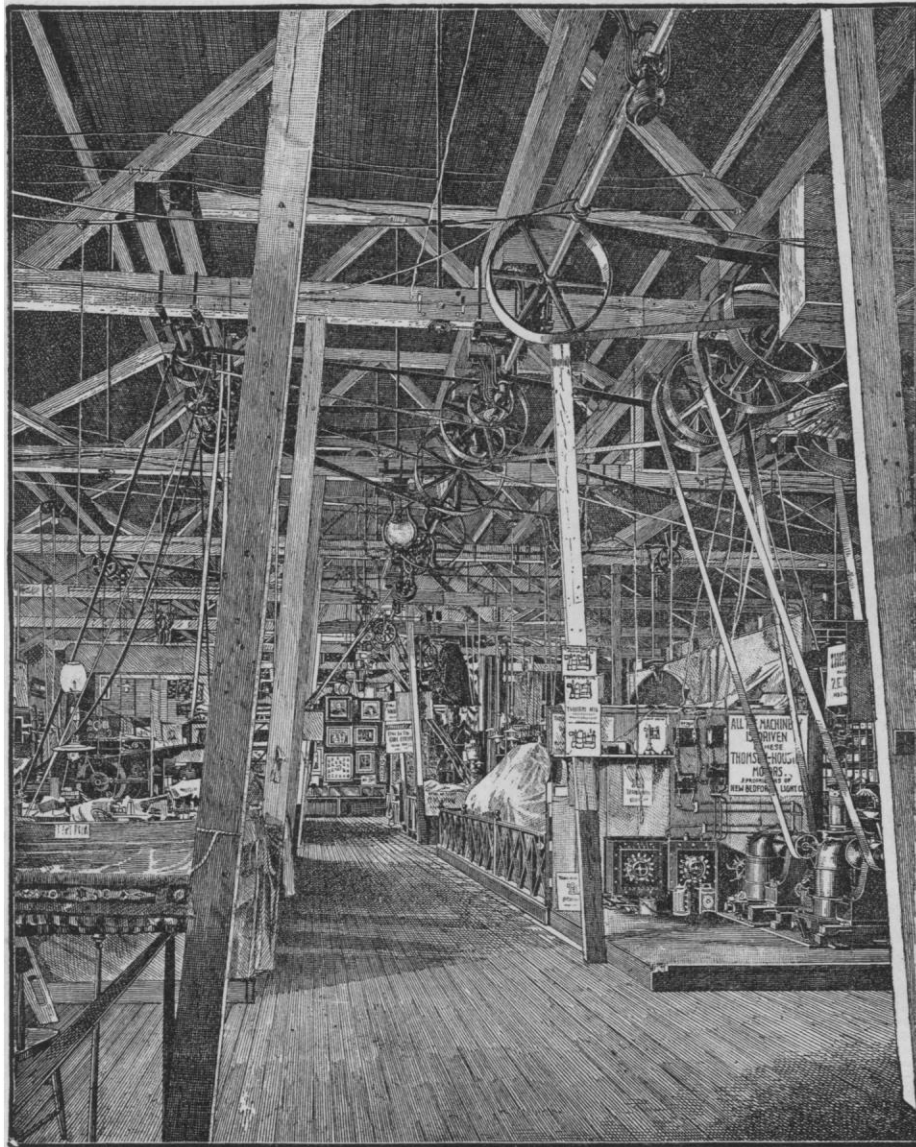
The following facts are significant as regards electrical propulsion: 1. The production, by modern stationary engines of the highest efficiency, of a horse-power for two pounds of coal, or less, per hour; 2. A recovery, in kind, from an electric circuit of reasonable length, of at least sixty-five per cent of the mechanical power applied to it; 3. The consumption by small stationary and locomotive engines of from seven to nine pounds of coal per horse-power per hour; 4. The consequent development in the circuit of a horse-power for three pounds of coal as opposed to seven or nine; 5. A marked reduction in original and current cost of motive power, due to lessened weight, simplicity, and diminished attendance; 6. A notably lower rate of deterioration than other machinery, due to the use of low-potential currents, absence of reciprocatory motion, etc.; 7. Conservation of permanent way, arising from the lessened weight of motor due to superior natural adhesion and the power of increasing the same magnetically to any necessary degree; 8. A unique economy arising from the fact that there is no necessity of having superfluous power in reserve,—a consequence of the capacity for instantaneous adjustment of a current throughout an entire circuit to the demands made upon it.

If one may judge by comparison with other mechanisms, the future of the dynamo-electric motor is pregnant with possibilities. The measure of perfection of any machine is the degree of efficiency with which it performs its specific work. Referred to such a criterion, dynamo-electric machinery stands, at the very starting-post of its career, infinitely nearer to its theoretical ultimate than the

out' added with a most graceful gesture, "Why, messieurs, with the Popp system you freeze the dead bodies in the morgue, and you cremate them in Pere la Chaise." And thus the idea is continually forced upon one's mind that this is an age of centralization in the supply of heat, water, light, and power, and, in fine, everything that makes life more comfortable, and business more practicable. The application of electricity to the distribution of power has been developed with comparatively more marked progress than the electric-lighting industry met with in the early stages of its existence; and this is not strange, when we consider the advantages of electric motors, and the fact that their use makes a material difference with small manufacturers in the item of cost of power, besides constituting an important feature of safety. The fact that the noisy, dusty, and dangerous steam-engines which are being used in so many printing-offices, book-binderies, and various other shops where power is needed, may be displaced by quiet-running electric motors, which are not dangerous and do not take up much room, added to the actual saving in money which is accomplished by such a change, are points which are so easy of demonstration, and commend themselves so readily to the popular mind, that the introduction of electric motors has not met with any serious obstacles. Although the first experimenters built motors before they built dynamos, it is only within the last two or three years that practical machines of a high efficiency have been offered to the public. Some of the machines now give an efficiency of over ninety per cent in the conversion of electrical into mechanical

energy; and it is plain that there is no possibility of very much improvement in the efficiency of conversion. The regulation of the electric motor is accomplished in some cases by artificial means; but in the most approved type of electric motors the regulation is in the machine itself, and depends upon an electrical principle as interesting and wonderful as any fact in the whole range of the science. Comparatively speaking, it is this. Dynamos and motors are interchangeable: when we put mechanical power to the machine, and make thereby electrical power for further use, we call the apparatus a dynamo-electric machine; if we reverse the process, however, and bring forth mechanical power by putting a cur-

motor take up its increased load. The change in the electrical condition is practically instantaneous, so that no change in the speed of the motor is perceptible within the moderate changes in the work which it is doing. With a maximum change in the load which the motor is carrying, the variation of the speed of the motor is within two per cent of its normal speed. Such close regulation, it is needless to say, is all that can be desired in any machine. The motors of the Thomson-Houston Electric Company, like all the other apparatus of that system, have been widely introduced, and are in use in many printing-offices, machine-shops, and small factories. They are made in sizes to furnish from one-half to seventy-five



THOMSON-HOUSTON MOTORS IN THE BOARD OF TRADE EXHIBITION, NEW BEDFORD, MASS.

rent of electricity through a machine, it becomes an electric motor. Every motor, while receiving the electric current and doing mechanical work, is at the same time retaining to some degree its character as a dynamo-machine; for it is generating a current directly in opposition to the current which causes it to run. This opposing current serves as a resistance to the current supplied to the motor, and varies with the speed of the motor.

Now, in the Thomson-Houston motor, which is here illustrated, if the speed has a tendency to slacken, this opposing current necessarily becomes less, and thus admits to the motor more of the supply-current, which, in its turn, brings back the speed of the motor to its normal speed. The working-power of the motor increases as the square of the current, so that a slight increase in the current (due to the momentary slackening of the speed) is sufficient to make the

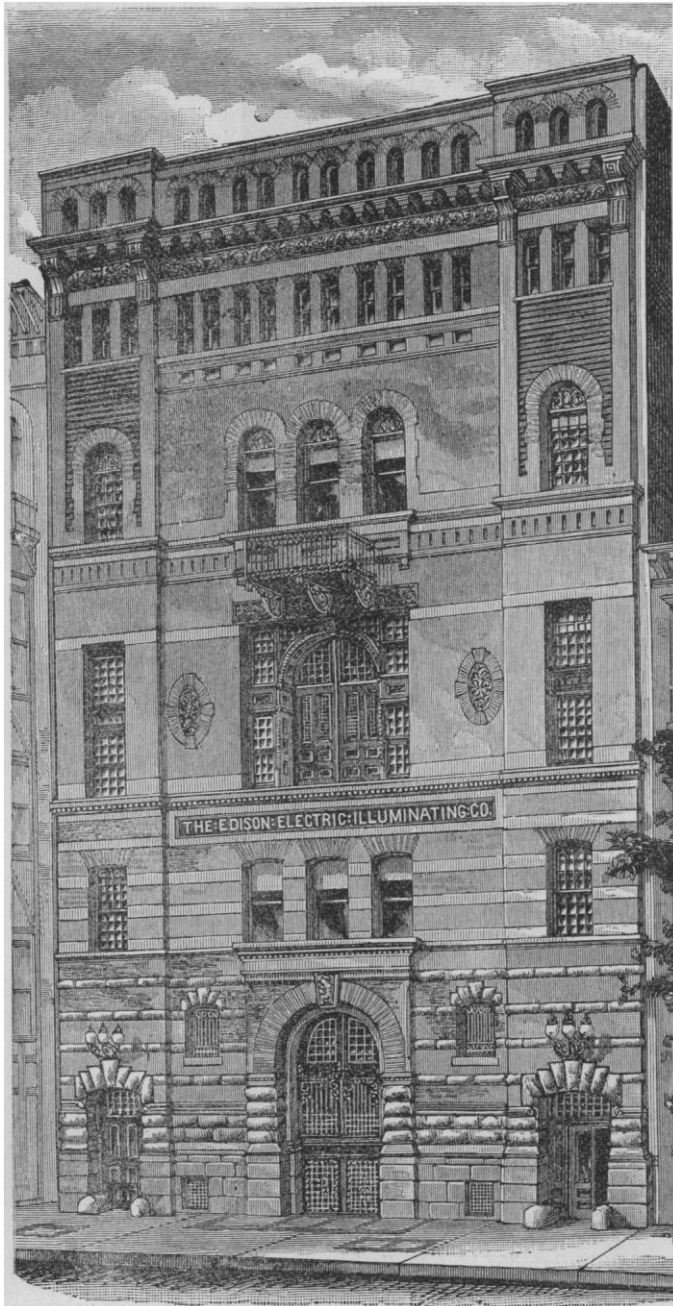
horse-power. The larger sizes are, of course, especially valuable for the transmission of power from waterfalls whose distance unfits their utilization by the old methods. Factories may be placed some distance from the water-supply, and get power over the wires.

In addition to the stationary motor, the Thomson-Houston Company have developed extensively those applicable to electric street-cars, having in operation twenty-three electric roads, and eleven in process of construction.

The accompanying illustration represents two Thomson-Houston motors in the exhibition of the Board of Trade at New Bedford, Mass. These motors are supplied by current from the central electric-lighting station of the New Bedford Gas Company, and are furnishing to the shafting all the power required in the various exhibits at this fair.

THE EDISON LIGHT FOR HOUSES, STORES, THEATRES, ETC.

THERE is probably no new industry of equal magnitude that is comparatively so little known to the general public, even in this city, as that of supplying the Edison incandescent light from central stations for interior illumination. Six years ago a small station was started at 255 and 257 Pearl Street. This station has been running continuously, night and day, since Sept. 4, 1882, and is now supplying some 15,000 lamps through a network of 56 miles



NEW EDISON CENTRAL STATION, W. 26TH STREET, NEW YORK.

of underground conductors. It was freely predicted that mechanical and electrical difficulties would constitute a barrier to its success; but, these apparently insurmountable obstacles having been overcome by the indomitable perseverance and peerless skill of Mr. Edison, the next prognostication was financial failure. In spite of these dire forebodings, the enterprise was long ago established upon a successful paying commercial basis, as a result of which the capitalists who were pioneers in the business have recently supplied the capital with which to construct two immense stations for supplying residences, stores, theatres, hotels, etc., in the upper portion of the city.

About 165 miles of conductors were laid under ground, covering a district from 18th to 59th Streets, and from Sixth to Fourth Avenues; and two substantial buildings were erected, — one on 39th Street, near Broadway; and one on 26th Street, near Sixth Avenue. These stations are about completed, and ready to furnish lights, and will have an ultimate capacity of 50,000 lamps each. This great luxury, so long enjoyed by many business-men in their downtown offices, will now be within reach of their uptown homes, and our citizens will welcome a light which does not heat or vitiate the atmosphere by burning up the oxygen; does not destroy or deteriorate decorations, pictures, books, etc.; obviates risk of fire; is as conducive to the preservation of eyesight as the natural light of the sun; and is capable of innumerable applications for ornamental and decorative purposes, as well as for the supplying of power for pumps, elevators, ventilating-fans, sewing-machines. For these and many other purposes the electric current will be ever present, night and day, and will be furnished and charged for by a meter the accuracy of which has been proved by six years of practical use, and at prices that will place one of the greatest luxuries of modern times within reach of all.

HADFIELD'S MANGANESE STEEL.¹

THE most notable contribution to the metallurgy of manganese and its alloys made in recent years is the paper read before the Institution of Civil Engineers of Great Britain by Mr. Robert A. Hadfield, of Hadfield's Steel Foundry Company, Sheffield, on Manganese steel, the invention of his father, but which the author of the paper has done so much to perfect. This steel has been described in previous reports, but Mr. Hadfield's paper sets forth so clearly some of the very peculiar properties that manganese in large quantities imparts to steel, that, with his permission, we quote from it at considerable length.

The most noticeable characteristics of the Hadfield manganese steel are its peculiar hardness, combined with great toughness, the effect of water-quenching upon the steel, and its electrical properties.

Peculiar Hardness.

It is difficult to accurately describe its peculiar hardness, because all the specimens are exceedingly hard; in fact, it is scarcely possible to machine any of them on a practical scale, yet such hardness varies considerably in degree, being most intense in the cast material, containing 5 to 6 per cent manganese, which no tool will face or touch. A gradual decrease is noted then, and, when about 10 per cent is reached, the softest condition occurs. Then an increase again takes place, and at 22 per cent it is very hard, still not so much so as in the 5 per cent. After passing 22 per cent, the cause of hardness becomes more complicated, owing to the presence of more carbon, 2 per cent and upwards; in fact, the material begins to partake more of the nature of cast iron, though as to strength, when compared with the latter, specimen No. 225 (carbon, 2 per cent; manganese, 23.5 per cent) had a transverse strength of 34 tons against 10 tons for cast iron.

The 8 to 20 per cent material can be machined, although only with the utmost difficulty, as will be seen from the following example. The test-bar No. 22 B (manganese, 14 per cent), which elongated 44.5 per cent without fracture and had a tensile strength of 67 tons, was put under a double-gear 18-inch drill. Over an hour was occupied in drilling one hole one half-inch in diameter by three-fourths inch deep; and even to do this it was requisite to run at the lowest speed, or the edge of the drill would have given way. During this time fifteen to twenty holes of the same size could have been easily drilled in mild steel. Similar results from specimens sent to different engineering firms in Sheffield and elsewhere confirm this test, yet this specimen could be indented by an ordinary hand-hammer; so that, whilst so hard, it may be said to possess "a special kind of softness." Although, when being turned, it appears harder than chilled iron, its softness is particularly noticeable when testing the material for compression. Specimens of 10-per-cent manganese steel 1 inch long by .79 inch in diameter,

¹ Extract from a paper on 'Manganese,' by Joseph D. Weeks, to appear in the forthcoming volume of 'Mineral Resources of the United States,' published by the United States Geological Survey, edited by Dr. W. T. Day.

notwithstanding they require several days' preparation in the lathe, owing to their hardness, yet, under a compression load of 100 tons per square inch, shorten .25 inch, and the harder kind (manganese, 15 to 20 per cent) .1 inch to .13 inch. Chilled iron or hardened steel would stand this test without any alteration. A cast specimen, No. 24 B (manganese, 14.75 per cent), not forged, made into a standard Whitworth test-piece, took nearly a fortnight to tool and finish.

The test-bar of the specimen (12.75 per cent) tested by Mr. Wellman, of the Otis Iron and Steel Company, Cleveland, O., was a day and a half in the lathe, as against half an hour for ordinary mild steel.

Owing to this peculiar hardness, its general application to castings has been limited by the difficulty of machining them, no method having yet been perfected by which the heads or runners can be cut off, or the castings otherwise tooled to shape. Tool steels from the best makers have been tried, including self-hardening kinds and tools made of manganese steel, but without success. The tests and applications, therefore, have necessarily been confined to castings, where the runners could be broken off cold or pared off hot.

Water-Quenching, and the Effect of Heat upon Manganese Steel.

Naturally one of the questions asked, when examining a new material said to be steel, or possessing the properties of steel, is, 'What effect has water or other cooling medium on it when plunged therein in a heated condition; in other words, will it harden?' Again: the behavior was found to be quite different when compared with ordinary carbon steel, no hardening action taking place. Water certainly causes the material to become stiffer, but in an entirely different degree to hardened carbon steel; for a piece of manganese steel, after such treatment, is slightly more easily touched by a file: therefore, for the following reasons, the process now described is termed 'water-toughening.' The increase in stiffness is most marked, the tensile strength rising from 40 to 60, and in some cases over 70, tons per square inch; but this is not a mere stiffening or hardening effect in the ordinary sense of the term, for in all carbon steel such rise is invariably accompanied, when the cooling medium is water, by a considerable decrease in the ductility or elongation, whereas in this material just the opposite effect is produced. In specimens Nos. 22 B and D⁹ the tensile strength of the bar as received from the forge was only 36 tons per square inch, with 1.56 per cent elongation. This latter is exceptionally low, usually being 6 to 8 per cent. After water-toughening, it rose to the extraordinary amount of 67 tons, with 44.44 per cent elongation; and even then the specimen was not fractured, as at this point it was considered worthy of being retained unbroken. The same result occurs if the piece under treatment be dipped when at a welding heat, though the carbon be as high as 1 per cent or more. With regard to those samples containing below about 7 per cent manganese, this treatment seems to exercise little or no influence, and the material is comparatively valueless where toughness is requisite. While touching upon this point, the results obtained by the Terre Noire Company of France with high manganese steel (1.75 to 2.25 per cent) should be referred to. It is stated that it was not possible to obtain test-bars when dipped in water or oil, as they either cracked or broke into pieces. Strange to say, not a single bar in these experiments has behaved so. Take, for example, No. 4 B, with 6.95 per cent of manganese, which may be termed comparatively low, and more approaching to the Terre Noire material: the test-bar, when heated to a white heat, could be safely plunged into either water or oil without being water-cracked.

After a large number of tests with regard to the action of heat and sudden cooling upon this material, generally speaking, it has been found that the higher the heat of the piece treated, and the more sudden and rapid the cooling, the higher will be the breaking load, and the greater the toughness or elongation. Six of the bars were heated as uniformly as possible to a yellow heat, and plunged into water of 72° F. These gave breaking loads varying from 57 to 63 tons per square inch, and elongations of 39.8 per cent to 50 per cent. As a comparative test, another test-bar of the same material, heated in precisely the same way and to the same de-

gree, but plunged into water at a temperature of 202° F., gave only 53 tons and 32.8 per cent. The more rapid cooling of the other test-bars was evidently the cause of their superiority, the chemical composition of all being the same.

It was also thought that sulphuric acid, being a rapid conductor of heat, might give good results as a cooling medium. The experiment was therefore made with a bath consisting of equal volumes of water and of sulphuric acid, and on 8 inches the extraordinary elongation of 50.7 per cent was reached with a breaking load of 65 tons, the bar being thus drawn cold $4\frac{1}{8}$ inches before fracture. Another specimen on a 4-inch length gave 56.75 per cent. The operation of merely heating the forged test-bar to a yellow heat and cooling it in air has a very beneficial effect, the elongation in most instances being increased to 15 and 20 per cent, the tensile strength also rising 8 or 10 tons per square inch.

As before pointed out, the temperature to which the bar is subjected has a marked influence. Although good tests result when the specimens are treated at lower temperatures, the best are obtained with as high a temperature as possible, the bars being thoroughly soaked, and plunged into cold water. Care, of course, must be taken that they are not burnt, or heated beyond a welding heat. In those specimens where the alloy is not so pure a mixture of iron and manganese, and the material cannot be heated so hot without crumbling, lower temperatures also give good results, viz., 40 to 46 per cent elongation. The best tests have been obtained with material containing 12 to 14 per cent of manganese, though those with 10.83 per cent are also good, considering their high breaking loads as compared with mild steel. However, special attention is drawn to the peculiar fact that an increase of 4 per cent in the manganese causes such a considerable rise, both in tenacity and elongation. The cause of this is very obscure, the only explanation offered being that the peculiar crystallization in the cast ingots seems to disappear gradually after passing about 11 per cent, and the fibre noticed is not so much a cause of weakness. This is only surmise, as to the eye the fibre in even the lower percentages entirely disappears in the hammered bar.

It is not easy to understand the action of the water-quenching process. As so ably explained by Chernoff, the effect of oil-tempering on ordinary steel is to produce a metal of fine grain, which possesses much greater strength than open, coarse-grained steel. If, however, forged manganese steel possesses any real difference of structure, after being heated and water-toughened, it is rather in the direction of a more open than a closer grain. But the most puzzling case in the author's experience is that of the cast-toughened 9-per-cent specimens, at which percentage, as before pointed out, the crystallization is very peculiar. An ingot $2\frac{1}{4}$ inches square and 2 feet long was cast in an iron mould. When cold, a piece was broken off, requiring four blows under a steam-hammer. The fracture showed the usual peculiar form of the 9-per-cent material, — a form which, to outward appearance, is unchanged by any heats short of the actual melting-point. The other piece was reheated to a yellow heat, and water-quenched. In this the toughness was increased in a remarkable manner, ten blows of the steam-hammer being required to break the bar. The appearance of fracture was unchanged. What caused the increase of toughness? In this case, certainly, it was not owing to structural changes, the pronounced form of ingot not being to the eye in any way altered. It will therefore be understood how difficult it is to offer any satisfactory explanation of these peculiarities.

Considering the effects of water-toughening, special attention is drawn to a specimen containing, carbon, 1.85 per cent; manganese, 9.42 per cent. Ordinary steel with this amount of carbon would be excessively hard if water-quenched even at a dull-red heat; in fact, it is questionable whether it could be hardened at all without being water-cracked. Yet the above specimen was heated to a high heat, plunged into cold water, and the bar was not water-cracked, and, if changed at all, slightly softer. Carbon seems, therefore, entirely deprived of its usual hardening properties, and it is probable that manganese must be partly considered as the cause of the high tensile strength of this material, that is, unless iron itself possesses the property of taking some other form not hitherto suspected. Further, iron so combined with manganese is rendered capable of elongating 50 per cent on 8 inches, against about 30 per cent in

the best brands of wrought iron, which contain about 99.5 per cent of iron, against 84 per cent in the manganese steel.

Electrical Properties.

This material possesses the peculiar property of being almost entirely non-magnetic. Rinman mentioned in 1773 that manganese diminishes, and in the end destroys, the magnetic properties of iron. This was also noticed in some specimens of manganese alloys made by Mr. David Mushet about 1830. This is especially curious, seeing that iron is present in amounts eight or nine times greater than the manganese itself. An approximate idea of the amount of manganese contained in the steel may be formed by passing a magnet over specimens. As the percentage of manganese increases, the magnet's power decreases. Upon reaching about 8 per cent, there is no attraction in the bulk, though fine drillings are influenced; but even this diminishes, as, when 20 per cent is reached, a magnet capable of lifting 30 pounds of ordinary steel or iron will only lift pieces weighing a few milligrams. On this point the material behaves in the same manner either in its forged or cast state, water or oil quenching making practically no difference.

Some interesting experiments with regard to the physical properties of manganese steel have been made by Sir William Thomson, Mr. Bottomley of Glasgow, and Professor Reinold of the Royal Naval College, Greenwich. Prof. W. F. Barrett, of the Royal College of Science, Dublin, has also experimented respecting its non-magnetic character and electrical properties. His experiments were carried out upon a sample containing, carbon, .85 per cent; manganese, 13.75 per cent; the wire being drawn to No. 19 British wire gauge. The author first attempted to draw direct from the rods, but with little progress; the wire, owing to its hardness, breaking into short lengths when being pulled through the wortles. Ordinary annealing was tried, but with no better results. As exceedingly good bending tests have been obtained with bars from the same steel, when heated to a yellow heat and plunged into cold water, the rods were treated in the same manner. These were coiled up, heated to whiteness, and plunged into cold water. The material was then easily drawn; but, after every reduction through two sizes, its ductility was again lost, and the operation of heating to whiteness and quenching in cold water was again necessary. A specimen has been subjected to white heat no less than five times, and is yet uninjured, as will be seen from the remarkable tensile tests obtained from it by Professor Barrett, viz., 110 tons per square inch, in its hard state. A similar result was obtained by the manager of the wire department at the Barrow Steel Works, the report being "that it would stand any tensile load up to 100 tons per square inch, according to the temper, and the elongation was extraordinary." The density, according to Professor Barrett, was 7.81, which is somewhat lower compared with the specific gravity obtained at the Hecla laboratory; viz., 7.83 on the same wire. The electric conductivity was found to be very low; No. 19 British wire gauge wire, .96 millimetre in diameter, having a resistance of 1.112 legal ohms per metre, or 75 microhms per cubic centimetre at 15° C. Ordinary iron wire is only 9,800, and German-silver 21,170; so that use might be made of the manganese steel for resistance-coils in electric-lighting. This has since been successfully applied by Dr. E. Hopkinson, in Messrs. Mather & Platt's electric department. Its high specific resistance, and capacity to stand heating, make it very useful for resistance-boxes. A length of 1,180 yards No. 8 British wire gauge (No. 634, manganese 13.95 per cent) was cut into three lengths, coupled parallel, the conductor consisting of three strands No. 8, then coiled into a box 3 feet by 2 feet by 2 feet, and gave a resistance of 6.5 ohms, carrying 80 ampères without over-heating. It was therefore capable of absorbing 55-horse power. To produce the same resistance with iron wire, 5,000 to 8,000 yards would be required, or, of expensive German-silver wire, 4,780 yards. Professor Barrett also finds that its increase when heated is only .136 per cent for each degree carbon, as against iron .5 per cent.

In the same way it is a bad conductor of heat. A rough test was made at the Hecla works by putting a bar of this material and one of ordinary wrought iron into a smith's fire. The latter became too hot to handle in about half the time required for the former. From this will be seen the importance of thoroughly 'soaking' this steel when forging it, or the outside only may be heated.

As regards its non-magnetic properties, a small piece of the No. 552 wire was not attracted in the slightest degree by the most powerful electro-magnet capable of lifting a ton; but, suspended by a thread, it behaved like a paramagnetic body. Professor Reinold found that the water-quenched or softened wire acquired slightly more permanent magnetism, but that with both a most sensitive galvanometer-needle was required to show that the material was not copper or other non-magnetic body. The exact amount was determined by Professor Barrett after most careful experiments. In comparing this with ordinary steel, he states that it was like weighing hundredweights and grains on the same balance. The magnetism of ordinary iron being represented by the figure 100,000, manganese steel is 20, and its susceptibility, i.e., the induced magnetization, is about as low as zinc or other non-magnetic metal. It is somewhat extraordinary to find no sensible attraction exerted on this steel by the most powerful magnetic field that could be obtained, this agreeing with Dr. Hopkinson's experiments. If other difficulties can be overcome, this peculiar quality should make it suitable for dynamo bed-plates. Ships built of such steel would have no sensible deviation of the compass. Magnetic influence, while not affecting this material, passes through it, so that a needle placed upon a flat sheet of manganese steel can be readily moved by a magnet placed underneath. The same thing occurs if brass or sheet copper be substituted, but not with ordinary steel or iron.

Further interesting experiments have also been lately made (September, 1887) by Profs. J. A. Ewing and William Low. The former concludes his experiments by stating, that, even under magnetic forces extending to 10,000 C.G.S. units, the resistance which this manganese steel offers to being magnetized suffers no change in any way comparable to that which occurs in wrought iron, cast iron, or ordinary steel, at a very early stage in the magnetizing process. On the contrary, the permeability is approximately constant under large and small forces, and may be therefore concluded as being only fractionally greater than that of copper, brass, or air.

MUSICAL BOXES.

MUSIC, both as a science and an art, has reached a stage of development so far advanced that further improvement in any department must necessarily seem slow and insignificant. Yet improvements are being made in many directions, seemingly small, but really great enough to demand more than a passing notice.

A good instrument is, of course, necessary to the production of

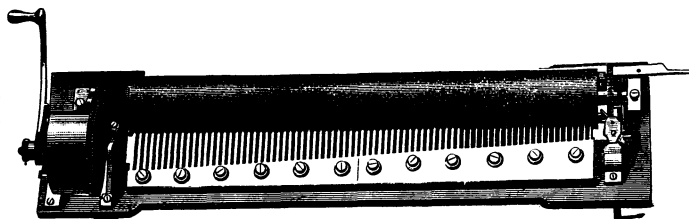


FIG. 1.

good music; but upon even the best of such instruments as the violin or piano, for instance, good music cannot be produced without the aid of a good musician. Of musicians, as musicians go, there are plenty, — ordinary every-day musicians, not born to the art, but bred to the business, working at music as a trade, not as an art; but of good musicians, with a heritage of genius supplemented by a lifetime of labor spent in study, there are few.

Most people are lovers of good music, or at least of melodious and harmonious sounds. Among these are many who are not musicians themselves, and by whom the services of a good musician are not at all times procurable, nor perhaps desirable. There is but one among the innumerable instruments in vogue to-day to which such persons can turn, — an instrument in which more or less successful attempts have been made to combine not only the parts to be played upon, perfect of their kind, but also as close an approximation to the executive talents of a musician as mechanical skill will give. This instrument is known as the musical box, not the crude mechanism of a few decades ago, but the improved instrument of to-day.

Musical boxes, properly so called, were invented about the beginning of the present century, and were at first exceedingly imperfect and costly. Since that time numberless improvements have been made, notably by members of the Paillard family, of Ste.

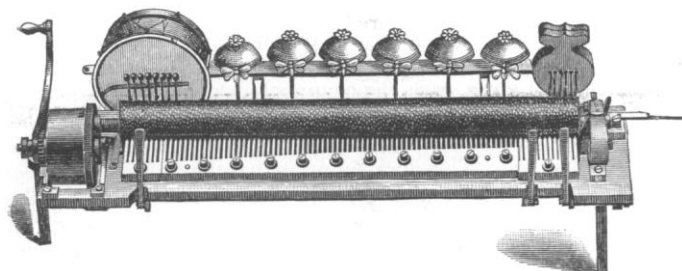


FIG. 2.

Croix, Switzerland, at which place they have been engaged in the manufacture of these instruments since 1814. Many of the musical boxes, as now made by this house and exhibited in New York, have attachments which bring into play various devices, such as bells, drums, and castanets, for adding to the general effect. There are

coupled springs and mandoline or tremolo harp-zither attachment. The characteristic feature of this box is that the same note is repeated consecutively, as is done on the harp, guitar, or piano.

An instrument with coupled springs and double comb or keyboard, giving a much louder and fuller tone, is shown at Fig. 4. An improvement on the coupled springs is shown at Fig. 6. It consists of a combination of four springs, enabling the instrument

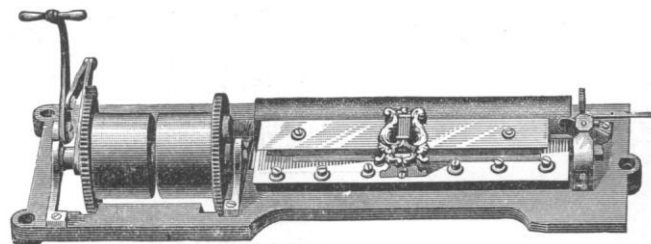


FIG. 3.

to run one or two hours with one winding. The orchestral musical box, the mechanism of which is shown at Fig. 5, has, besides the devices already mentioned, a flute or 'celestial voice' attach-

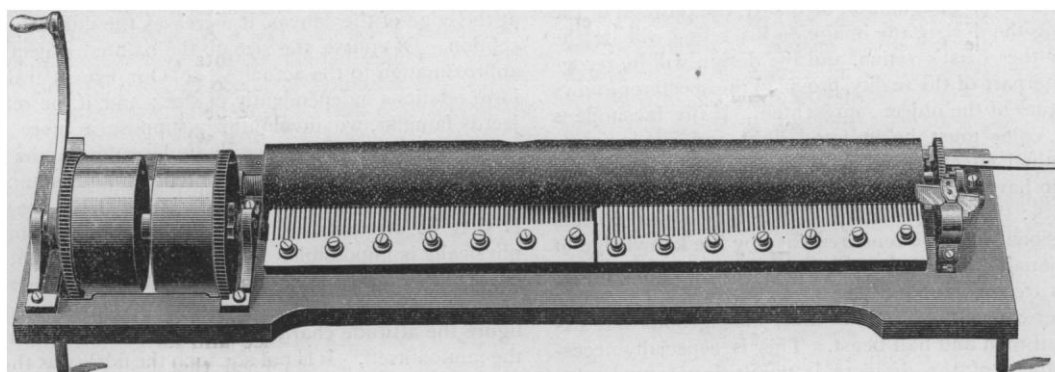


FIG. 4.

also what are known as the 'mandoline or tremolo harp-zither' attachment, 'sublime harmonie,' 'zither harmonique piccolo and tremolo,' and 'orchestra.' These boxes are furnished with one, two, or four springs, and single, duplex, or interchangeable cylinders.

At Fig. 1 is shown the cylinder, comb, and spring-barrel of an

ment, consisting of reeds placed in the centre of the keyboard, and vibrated by air from the bellows underneath the bed-plate.

One of the recent improvements in these instruments is what is called the 'interchangeable cylinder' system, the advantage of which is that additional cylinders may be obtained at any time, ready for

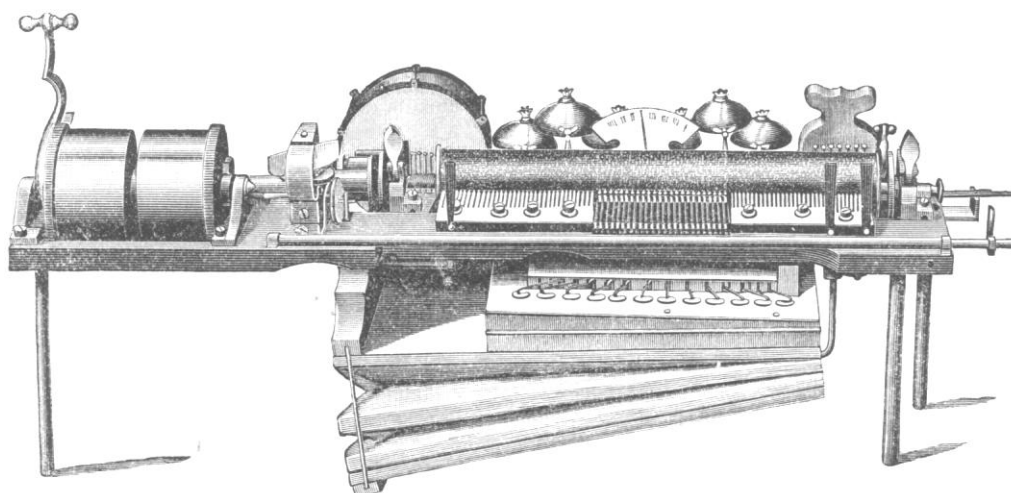


FIG. 5.

ordinary musical box. The winding-lever stands at the extreme left, and the small fan-shaped governor for regulating the speed may be seen at the right. Fig. 2 shows the works of a box with drum, bells, and castanets. These attachments may be silenced separately or together. Fig. 3 shows works with thirty-minute

immediate use, without the necessity of sending the box to the factory to have them fitted. This is an adaptation of the interchangeable system so much in vogue in the manufacture of sewing-machines, type-writers, and similar articles.

Few persons have any idea of the extent and importance of the

trade in musical boxes, but a visit to the establishment of M. J. Paillard will convince the most sceptical that automatic musical in-

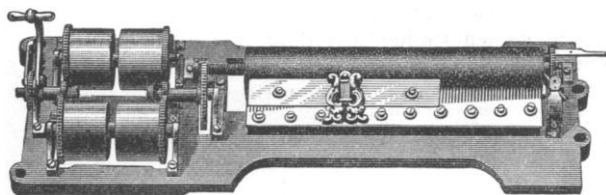


FIG. 6.

struments play an important part in satisfying the musical demands of the public.

MENTAL SCIENCE.

The Illusions of Drawing and Painting.¹

THE arts of drawing and painting depend upon the possibility of presenting to the eye a result in two dimensions of space which it will readily transform into one of three dimensions. In this process there is a large element of illusion — of conscious, designed illusion. The chief factor in this process is perspective. If the spectator take, whether in imagination or reality, the position of the artist when making the design, the image on his retina will be the same as that on the artist's retina, and the design will be recognized as the counterpart of the reality, provided the spectator knows in general the nature of the object represented. If the facsimile is to be more exact, color must be imitated, light and shade introduced, and the retinal effect copied with all the skill of eye and hand. In order to have an æsthetic effect, the picture must represent known objects: the interpretation of two-dimensional objects into three-dimensional must be rendered easy by the knowledge of the three-dimensional. The artist must not create entirely new forms: exceptions are apparent only, and prove the rule. The poetic monsters are either conventionalized, or unite incongruous but existing forms, — half man and half beast. This is especially necessary when the object of the drawing is purely intellectual, — to make clear something not easily expressed in words, such as designs for houses, mechanical constructions, and the like. Here a more or less exact knowledge of the type of object represented is needed. To the layman such designs have little meaning.

In artistic painting, however, it is not the most detailed and exact drawing that produces the best result. Photography excels all manual art in this, but its effect is of a lower order. The same can be said of those clever productions by which a bas-relief appears drawn in two dimensions, or the objects of a panorama to stand out in three. One admires the skill, but it is a curiosity rather than a piece of art. But the object of art is not servile imitation, not to give the spectator an absolute illusion, but to arouse certain feelings, certain thoughts; and those details must be chosen that bring to mind the appropriate sentiments.

The spectator of a painting never loses entirely the sense of viewing a painted surface: for (1) the drawing is strictly accurate only for one point of view; every change of position vitiates the perspective; (2) the phenomena of binocular vision prevent the illusion (the points of the canvas are seen at the real distance of the eye from the canvas, and not at the various distances required by the perspective; while, furthermore, the real object would form different images on the two retinæ, and the painting gives two nearly alike); (3) even in viewing objects monocularly, we get impressions of distance, for the eye constantly moves, while these changes are quite different in viewing a painting with one eye (the illusion of a painting is no doubt increased by regarding it monocularly through a hollow tube); (4) color and light can be imitated, but their mental effect is recognizably different from that of the real objects.

A picture placed in a horizontal position produces the illusion nearly as well as in a vertical position. If it be a marine view, the water does not seem vertical in the former case, though in the latter it seems horizontal. If it be an architectural design, it is not displaced, any more than we confuse directions when we gaze at

an object in a reclining position. This is the result of much practice in seeing the form of representations irrespective of their position, and in transforming the actual retinal image into the one that the artist intends. If you dispense with all light and shade, with all color, with all perspective, and leave simply a bare outline, then we can see in such an outline all the various designs which it can physically represent. If you draw one square within another and join the corners, you can see such a figure either as the description just given, or as the picture of a shallow trough looking into the bottom, or as a view of the same object from the bottom; and so on. Light and shade, familiarity with the design, decide what we shall see. This does not mean that the artist may neglect perspective, but only that the object of the perspective is to make easy the mental apprehension of the spectator. Cases occur in which a painter violates the rules of perspective, if by following them he would produce a scientifically accurate but apparently unnatural result.

In the perception of distance the objects touching the lower edge of the canvas are, as a rule, meant to be seen as in the plane of the canvas. This gives the spectator his point of view, while the framing of the picture by supplying a vertical and a horizontal, aids very materially his conception of position. If in a landscape we have the ground touching the lower end of the canvas, and the sky the upper, we can judge distances best. If a prominent object is cut at the edge of the canvas, it increases the difficulty of distance perception. Of course, the size of the painted objects need bear no approximation to the actual size. Our eye is trained to perceive form relations independently of size; and, if the real size of the object is familiar, we involuntarily suppose a more distant point of view. So, again, we generally underestimate the size of colossal figures, because we allow too much for our distance from them.

A more complete proof that imitation is not the artist's chief aim is that he attempts to represent motion in a single view, which physically is impossible. When a tree is represented in a wind, its branches are shown bent and strained in the direction of the wind; and this gives us at once the picture of a wind, of motion. So in a figure the attitude characteristic of a series of motions stands for the motion itself. It is not so much the fidelity as the suggestiveness of the attitude that is important. So, again, when objects move very rapidly, they become indistinct to our vision, and by painting them as indistinct the illusion of rapid motion is aided. If the motion is too rapid for the eye to follow, as in the rotation of the spokes of a carriage-wheel, the peculiar appearance can be imitated on canvas, and suggests extreme speed.

In the walk or run of an animal, although one position follows another with great rapidity, the eye selects certain positions as typical, and these the artist uses as the presentation of movement. Generally the position at the beginning or the end of a step is chosen. Instantaneous photography shows the great variety of positions in passing from one step to another; but many of these have an unnatural appearance to the eye, and the artist cannot utilize them.

A very distinctive illusion is shown in many portraits in which the eyes seem to follow the eyes of the spectator. This occurs when the model's eyes are facing the artist's. We assume the position of the artist, and so have the eyes in the picture looking at ours. If we move to one side, we get the illusion of the portrait's turning about, because the eyes still suggest direct vision, and the rest of the pose does not strongly contradict it. This lateral displacement, brought about by a change of position, is very slight in a painting, while very marked in a three-dimensional object. Paintings of animals frequently show similar effects. The true artist must understand and utilize such illusions, for they make the difference between what is lifelike and what is artificial.

THE HOMING INSTINCT. — Dr. George M. Gould (*Progress*, October, 1888) has collected authentic cases of animals finding their way homeward over long distances. Dogs, even when carried away in a blindfolded or drugged condition, find their way home over distances from five to five hundred miles; and in one case, when the dog was taken off along the two sides of a triangle, he came home by the third side. The exquisitely trained instinct of the flying pigeon, and similar capabilities of most animals, show the

¹ By M. J. L. Soret, in *Revue Scientifique*, Nov. 3, 1888.

great importance of this faculty. By way of explanation, Dr. Gould suggests, that, without the faculty of finding the way homeward, the sphere of an animal's life would be very narrow. The maintenance of the species would develop the power of seeking new fields and the power to turn homewards. The ordinary senses cannot account for this homing instinct, as actual experiments have shown. Dr. Gould sees here the true sixth sense, and regards it as a sensibility to changes in electric and magnetic tension, due to position on the earth's surface. The home is the animal's north pole. By habit, it is accustomed to the magnetic conditions there, but when away is restless, and finds its way homeward by this mysterious compass. Dr. Gould connects with this some fanciful speculations as to the import of the pineal gland as a possible magnetic organ, and some hints as to the physical nature of homesickness in mankind.

ELECTRICAL NEWS.

A Novel Telephone.

WE take the following from a recent issue of the *New York Electrical Review*: "The Lowth stettio-telephone hails from Chicago, and is a combined transmitter and receiver. A hollow extension about four inches long is attached to the receiver, from the end of which a small button protrudes slightly. The button is placed against the throat near the vocal chords, and the receiver is held against the ear in the usual manner. When the operator speaks, the vibrations of the throat are transmitted with, it is said, distinct clearness. The instrument is operated by the muscular vibrations that accompany the utterance of words. The inventor, James Lowth, is said to have been experimenting and working on this instrument for over ten years. When he first applied for a patent, three years ago, the authorities at Washington thought him a crank, and refused to issue one. He attached the instrument to wires in the office, and asked over it, 'What do you think now?' Back over the wire came, 'I give in. It works perfectly.' Our Chicago informant says it has been successfully operated between that city and Milwaukee, and in Pittsburgh it worked over a line seventy-five miles in length, on which were twenty-five Bell instruments." While, if the evidence is correct, this instrument certainly works, yet it is difficult to see how sounds produced by changing the relative positions of the tongue, teeth, and lips, such as go to make up a large part of the human voice, are accurately transmitted by this telephone. Never having seen one of these instruments, we do not yet "give in."

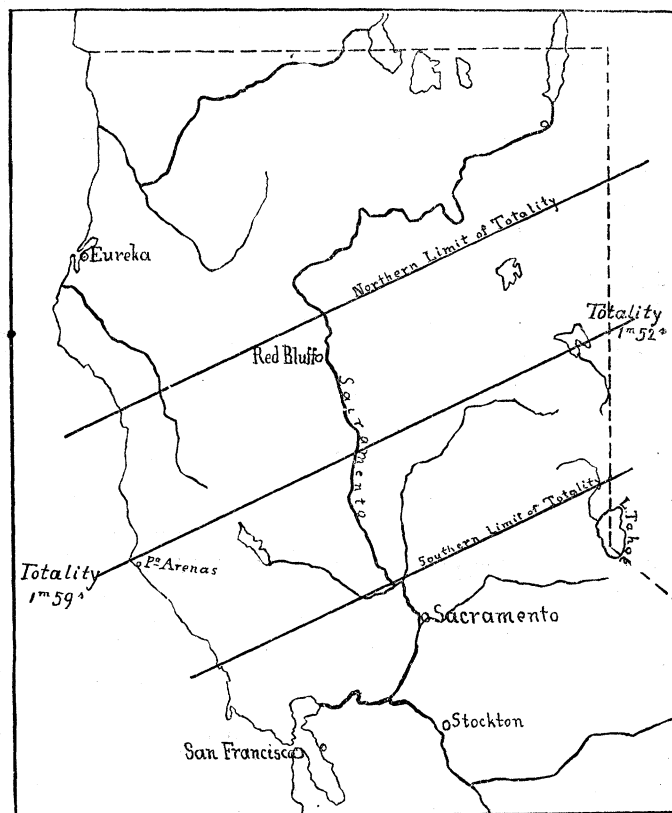
FAURE'S NEW SECONDARY BATTERY.—In this battery M. Faure uses finely divided metals pressed together in a self-supporting mass, or metal plates are used having combined with them finely divided particles of the same metal. Each plate is surrounded by a sheet of prepared asbestos, the sheet being a thirty-second of an inch thick, dipped first into some soluble salt, and then into a solution of a soluble silicate capable of producing with the first an insoluble compound. In his cell M. Faure uses zinc combined with finely divided zinc, and copper combined with finely divided copper. The solution used is phosphate of potash. On subjecting such a cell to the action of the electric current, phosphate of copper is formed on the surface of the copper element. M. Faure then substitutes a fresh solution of phosphate of potash, and, upon discharging the battery, phosphoric acid is transferred from the solution to the zinc, and from the copper to the solution; so that the solution remains unchanged as regards its constituent elements. The preliminary preparation would be avoided if phosphate of copper were placed upon the copper element in the first instance; but phosphate of copper is not easy to obtain and manipulate, and the process described is said to accomplish the desired object.

AN ITALIAN COMMISSION ON ELECTRIC TRACTION.—The Società Anonima degli Omnibus of Milan some time ago selected three engineers to travel through Europe, inspect the various electric-traction roads in operation, and report on the adaptability to the tramways in Milan. The main part of the report of the experts is taken up with the description and discussion of storage-battery systems; overhead, underground, and rail conductor systems being only incidentally mentioned. The commission was unable to make

a report on any line that was a complete financial success. The system in Brussels has not given perfect satisfaction, although improvements have been made that will reduce the cost. The road is on a small scale, however, and it does not necessarily follow that it would not pay, even now, if it was on a larger scale. The road, too, is a difficult one, with long grades of over three per cent. A careful study was made of the different types of accumulators in use at present, and an estimate is made of the comparative cost of storage-battery traction, as compared with that of horses. As a result, the commission advised that electric cars be tried, and states that it would be an honor to Milan, which was one of the first cities in the world to adopt electric-lighting on a large scale, to be also one of the first to utilize electricity for the propulsion of its tramcars.

NOTES AND NEWS.

MR. H. P. TUTTLE has recently indicated on a map of California the shadow path of the total eclipse of the sun which occurs on Jan. 1, 1889, and through his kindness we are enabled to reproduce this map. The cone of darkness will first appear on the western



coast of California, the central line passing near Punta Arenas. The space within the lines marked 'northern limit' and 'southern limit' indicates that in which the eclipse will be total. The duration of the eclipse will be about two minutes.

—During the past week the Society of Amateur Photographers of New York has been holding at its rooms, 122 West 36th Street, an informal exhibition of prints, the work of members of the society. The exhibition has proved very successful; so much so, that, at the request of many visitors, the exhibition will continue until Saturday, Dec. 15. About six hundred pictures are exhibited, and include views in many parts of Europe, China, Japan, Corea, the United States, historical buildings in this city, flash-light pictures, etc. The rooms will be open from 10 A.M. to 6 P.M., and from 7 to 10 P.M. every day and evening this week, except Tuesday evening. There is no charge for admission, and non-members of the society wishing to see the exhibition can obtain tickets by writing to the secretary of the society.

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THE UNITED STATES HYDROGRAPHIC OFFICE has so largely increased its field of work and usefulness within the last few years, that the hydrographer's report to the chief of Bureau of Navigation will receive attention not only from the naval service and the maritime community, but from a large portion of the scientific world, and the public generally. In fact, there can be no more praiseworthy object kept in view by officers of both the army and the navy than the maintenance and encouragement of public interest in, and acquaintance with, the organization, management, and general conduct of at least such of their offices and bureaus as appeal in any special way to popular interest. There is undoubtedly no branch of the Navy Department to which this consideration is so applicable as to the Hydrographic Office, in view of the recent extension of its field of work by means of the branch offices established already in six of our principal seaports (Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco), and authorized in two more (Norfolk, Va., and Portland, Ore.). The importance of this step, carried into effect by the recent hydrographer, Commander J. R. Bartlett, with the support of the chief of Bureau of Navigation, Commodore John G. Walker, is so great, in its relation to the navy, the maritime community, and the shipping interests

of the whole country, that a brief review of the working of these branch offices may well be given in this connection. Complete sets of charts, sailing-directions, light-lists, and other nautical publications, are kept at hand, together with standard barometers and thermometers; and masters of vessels can obtain the latest and most reliable information regarding every subject connected with navigation. These facilities have been so generally taken advantage of, that chambers of commerce, maritime exchanges, marine insurance companies, and other commercial bodies, are enthusiastic in their approval. Advantage has been taken of the cordial relations thus established with shipping men to collect a large amount of data relative to hydrography and marine meteorology, much of it of a high order of scientific as well as practical value; and every effort is made to publish the results, in order that they may be known and utilized. Thus the publication of the 'Monthly Pilot Chart' was a very happy thought, and it has become of recognized value and authority, and a most important adjunct in the work of the office. The tabulated statements accompanying the hydrographer's report, giving in detail the work of each branch office during the year, illustrate what an important part these offices play in the collection and dissemination of nautical information. It is highly gratifying to learn from the report of the present hydrographer, Lieut. G. L. Dyer, U.S.N., that the standard of efficiency already attained is likely to be maintained, and even increased, and that, while the relations of the office to the navy are of course regarded as of paramount importance, its *raison d'être* being to supply our vessels of war with reliable charts and nautical information of every kind, its relations to the commercial marine are given their proper share of attention also, and a broad view is taken of the part that the office has taken, and should continue to take, in facilitating the scientific study of every problem relating to the ocean. In this connection too much praise cannot be given to the cordial co-operation between this office and the Signal Service, in collecting and utilizing, without either duplication of work or friction of any kind, meteorological data relative to the ocean and the land.

IN LOOKING OVER the columns of the technical journals devoted to electrical industries, one is struck with the rapidity with which the applications of electricity are being extended. Dozens of new electric-lighting stations are commenced each week, while the applications of electric motors to street-car and stationary work occupy a considerable space in these journals. This is very encouraging, and shows that electric-lighting and the distribution of power have taken a permanent place, and are, under certain circumstances, paying investments. But, at the same time that we read of this rapid growth, we note an extension in another and less promising direction. New companies are being constantly incorporated for the manufacture of electrical apparatus, — lighting and motor systems, storage and primary batteries, fire-alarm and gas-lighting systems, — few of them with a capital of less than a hundred thousand dollars, the majority with a capital varying from that figure to one or two millions. If we will investigate these corporations, we will find that in many of them a large amount of the stock is reserved for the patent rights and for the promoters, and the amount left to supply the working capital is a comparatively small proportion of the whole. The investors find themselves in the position of subscribing the total working capital to a company, paying from the profits liberal salaries to the officers of the company, who are usually the incorporators and the owners of the patents, and who, controlling the majority of the stock, can fix their own compensation; and finally they receive only a small proportion of the earnings, — in many companies from one-half to one-tenth, — if there happens to be any. It should be remembered by investors that patents, unless they are fundamental in their character, are not of very great value. A larger part of the new corporations that have been recently formed operate under patents that are little better than a number of other devices for accomplish-

ing the same purpose. Edison, for his fundamental and valuable patents in electric-lighting, has received less share in the stock of the Edison Company than have the patentees of some small improvement in an electric gas-lighting or fire-alarm device in the companies that have been formed to promote them. It is too often the case that the small cash capital subscribed is used to make a good showing for the company until the promoters have sold their stock, when the company is very liable to suspend. All this very seriously retards the progress of electrical industry. Neither those who lose in companies like the above, nor their friends, are very likely to invest again; and the result is, that the companies that can do legitimate and remunerative work have trouble in getting the capital necessary to develop their business as fast as they would otherwise be able. That there is an immense field for work, and remunerative work, is shown by the wonderful growth of such companies as the Edison, Brush, Thomson-Houston, Westinghouse, Sprague, and others. But we would advise all investors in electrical companies to first find whether they are legitimate business enterprises, with a fair amount of capital allowed for patents, supposing they work under patents, and then to try and find out whether there is any merit in the plan that is to be introduced. The promoters of the company are not the best persons from whom to take evidence as to its value. As for investments in local lighting companies, if there is an efficient management, and if a proper local franchise can be obtained, then, unless a very uneconomical system is chosen, and the local conditions are unusually unfavorable, it is the experience of the last few years that the company should pay good dividends. While we believe, then, that electricity offers an excellent field for investment, and that well-managed companies will pay, yet we cannot too strongly urge investors not to rush blindly into investments on the strength of the representation of interested parties. The advantages of electricity for lighting must lead to its almost universal adoption in the near future, while its adaptability to the distribution of energy opens an almost limitless field for motor-work. The one thing that could most retard its progress would be a condition of public distrust caused by unwise investors, who will equally injure electrical interests and themselves.

THE THIRTEENTH ANNUAL REPORT, which President Gilman has just presented to the board of trustees of Johns Hopkins University, is very interesting reading. It incorporates reports, drawn with some attention to detail, by the various heads of departments, dealing with the specific work accomplished under their respective supervision. This is a feature of considerable value to those who are following closely the development of university work in the United States, and is not unfamiliar, as President Barnard has printed such appendices to his annual report to the trustees of Columbia College for several years past. Mr. Gilman characterizes the academic year 1887-88 as one of steady advance. "The number of students has increased, the standard of scholarship has been maintained, the publications have been as many as ever, the fidelity and enthusiasm of the principal teachers cannot be too strongly commended." Reference to the financial condition of the institution is made in these words: "Our only cause for anxiety is one of which you are fully aware, — the loss of income from the stocks which were given to the university by its founder. Your wisdom, gentlemen of the board of trustees, will no doubt devise some efficient relief. I believe it to be a reasonable expectation that the efforts which you have put forth, and which you have encouraged others to put forth, for the establishment of a university, will receive financial support when you are ready to ask for it." The academic staff included, during the year, fifty-seven teachers. The number of students enrolled during the year was four hundred and twenty, of whom one hundred and ninety were residents of Maryland, one hundred and ninety-six of other States, and twenty-five of foreign countries. Of this number, two hundred and thirty were already graduates of

other institutions. The degree of B.A. was conferred on thirty-four candidates, and that of Ph.D. upon twenty-seven, during the year.

The guiding principle upon which Mr. Gilman has developed the university is eminently sound. In view of the numerous newspaper reports and articles concerning Columbia College and its development, the perusal of the following passage from the report before us is recommended to the trustees and faculties of the latter institution. "We continue to adhere," says Mr. Gilman, "to a definition which is hallowed by age and confirmed by experience, that a university is a body of teachers and scholars, — *universitas magistrorum et discipulorum*, — a corporation maintained for the conservation and advancement of knowledge, in which those who have been thoroughly prepared for higher studies are encouraged to continue, under competent professors, their intellectual advancement in many branches of science and literature. In this society we recognize two important grades: (a) the collegiate students, who are aspirants for the diploma of bachelor of arts, to which they look forward as a certificate that they have completed a liberal course of preliminary study; and (b) the university students, including the few who may be candidates for a higher diploma, that of doctor or master (a certificate that they have made special attainments in certain branches of knowledge); and a larger number who, without any reference to a degree, are simply continuing their studies for varying periods. Corresponding to the wants of these two classes of students, we have two methods of instruction, — the rule of the college, which provides discipline, drill, training, in appointed tasks, for definite periods; and the rule of the university, the note of which is opportunity, freedom, encouragement, and guidance in more difficult studies, inquiries, and pursuits."

THE CLAIMS OF THE ENGLISH LANGUAGE TO UNIVERSALITY.¹

ALL efforts to create a new language for international use are really unnecessary, because we already possess a vehicle of communication, in our native tongue, which, if not perfect, is sufficiently so, and is at least as good as any that has been proposed. Whatever imperfections may be discerned in English, their removal, if thought necessary, can be easily accomplished in books for foreign learners. But, taking our language *as it is*, and comparing it with other languages, I think I may claim assent to a few fundamental propositions.

The first proposition is, English is as readily *understood* by foreign learners as a foreign language is by English learners. This statement might be strengthened; for the inflection of words in other languages requires much preliminary study to enable a learner to translate; whereas the student of English has only to deal with words which are, for the most part, unchanging, and the full meaning of which, consequently, he learns at once. English is therefore, in reality, *more* readily understood by a foreign learner than a foreign language is by an English learner.

The second proposition is, English is as readily pronounced with *intelligibility* by foreign learners as a foreign language is by English learners. Accuracy of pronunciation, according to native standards, is by no means essential to intelligibility. This is especially true of English. We hear speakers mispronounce every element in a sentence, yet they are understood; and the substitution of one sound for another is a very common habit: as in forming *th* instead of *s*, and "lipping all the hissing sounds;" or "croaking the sound of *r* far back in the rasping throat;" or "protruding the sound through the narrow, rounded aperture of the approximated lips;" or in substituting *t* for *k*, as when little Missie "calls her tiny kitten to come, that she may catch it." We understand the lisper, the burrer, the infant prattler, and the foreign stumbler

¹ Address delivered by Dr. A. Melville Bell before the Nineteenth Century Club, New York, Dec. 12, 1888.

over our speech; and, however imperfect the latter's pronunciation may be, it is in general quite as intelligible as our own attempts at foreign utterance.

The third proposition is, The *correct* phonetic elements of English may be acquired with native accuracy by foreign learners as readily as the elements of a foreign language can be similarly acquired by English learners. The "broken English" of foreigners, and the wretched attempts at foreign speech by school tyros, result simply from the want of timely and precise direction. There is not a sound in any language, which a learner, of any nationality, cannot be taught to produce with all the characteristics of native utterance; and English sounds, as compared with the phonetic elements of other languages, are organically easy of formation. The difficulties of pronunciation which have been complained of in connection with English, arise mainly from the ambiguities of spelling. Let a learner see exactly what he has to pronounce, and he will do so with facility. There are, indeed, clusters of consonants—the very strength of the language—which test articulative ability to enounce them smoothly and without hiatus; but a good speaker delivers them—to quote the words of Austin's "Chironomia"—"as beautiful coins newly issued from the mint, neatly struck by the proper organs, deeply and accurately impressed, perfectly finished, distinct, sharp, in due succession and of due weight."

The fourth and last proposition is, In regard to the expression of *ideas* with definiteness, fulness, and directness,—the main object of speech,—English is not inferior to any language. Inflected languages are generally briefer in expression; but English, with its separate words, not only for ideas but for nearly all the relations between ideas, is more elastic and variable in construction; admitting of niceties of distinction in phraseology, which are a source of precision and appositeness, emphasis, or elegance in diction.

These propositions merely assert the claims of English to a degree of fitness for international use at least *equal* to that of any language. Other considerations will be found to establish a *supremacy* that is no less indisputable.

The crowning recommendation of the English language for universality is the simplicity of its grammar. In this respect English is immeasurably superior not only to other national tongues, but also to every form of artificial language that has been devised. The various moods and tenses, declensions and conjugations, which burden other grammars have practically no existence for us. We express by combinations of simple words the import of complex inflections. The words are easily learned and remembered; whereas the inflections are perplexing to learn, and their recollection is a constant tax on the memory. If brevity were the principal desideratum, then the meaningful adjuncts to root-words—in substantive, verbal, and other terminations—might be preferable to the detached words by which we convey the same ideas. But brevity would be too dearly purchased at the cost of such a category of shifting enclitics. English is happily almost free from these, but it presents a solitary example of such freedom, as if the language had been predestined to universality, and by this means made ready for its great function. An English word expresses a thought definitely, absolutely, fixedly; the words of an inflected language are unsteady in the mind, and they veer to point after point of the logical compass, under the influence of the little rudders of grammatical inflection.

But, while English grammar is unquestionably the simplest of all grammars, it is still susceptible of further simplification. The chief advantage claimed for some artificial languages is that their rules are absolute, and free from exceptions. But there is no reason why English should not be relieved from its small growth of irregularities, and its rules made equally free from exceptions. For example: its irregular forms of the plural in nouns, and of the preterite in verbs, might be made regular: that is, it might be permissible to form the plural always by adding *s* to the singular, and the preterite always by adding the sound of *t* or (*e*)*d* to the infinitive, and write 'childs' for 'children,' 'mans' for 'men,' 'mouses' and 'gooses' for 'mice' and 'geese,' 'goed' for 'went,' 'knowed' for 'knew,' 'seed' for 'saw,' 'singed' and 'bringed' for 'sang' and 'brought.' The literary forms of such words would be alternative modes of expression, for which a preference might be indicated be-

cause they are established in our literature. The dictionary would read,—

Ox: <i>plural</i> oxes, or oxen.	Do: <i>preterite</i> doed, or did.
Sheep: " sheeps, or sheep.	Let: " letted, or let.
Tooth: " tooths, or teeth.	Seek: " seeked, or sought.

Such changes need not be prescribed, but simply allowed, *ad libitum*. They would, for the most part, be a mere revival of old forms, many of which are not entirely obsolete.

A few other irregularities might be similarly rectified. For example: why might not degrees of comparison—when not expressed by the separate words 'more' and 'most'—be always formed by adding *er* and *est* to the positive? In this way the words 'gooder' and 'goodest,' and 'weller' and 'weldest,' would be allowable alternatives for the irregular words 'better' and 'best,' which now do duty as comparatives for both 'good' and 'well.' To *legitimize all words formed on accepted rules—without disturbing established exceptional words—would remove the only source of difficulty from the language.* A few more words would be added to the dictionary, but the vocabulary would be enriched by a corresponding increase of phonetic variety.

These suggestions are made now for the first time. The advisability of adopting them must be left to the decision of other minds. But there can be no doubt that the recognition of such alternative modes of expression would be a convenience to learners in their early attempts at *writing* the language.

English has a further recommendation for universality, in its already wide diffusion. It is the vernacular tongue of a far larger number of persons than any other language; and it is undoubtedly studied as a foreign tongue by a larger number than any other. By its phonetics, its copious expressiveness, and its ready intelligibility, English is at least as well adapted for international employment as any language; while, in regard to grammatical simplicity and widely established use, it has a fitness pre-eminent over all other languages, natural or artificial.

How, then, can we account for the fact that this obvious fitness is not universally recognized, and that schemes for artificial languages are still seriously entertained and laboriously developed? The reason is not far to seek. The English language and its orthography are two distinct things. The language is almost all that could be desired; the orthography, almost all that can only be deplored and condemned. Our spelling is disorderly, difficult, misleading, marred both by redundancy and deficiency of letters, and it requires more time and labor to master it than the language itself does. And why? Simply because, for distribution among upwards of forty phonetic claimants, we have only two-thirds of that number of letters. Fully one-third of our sounds are thus compelled to be wanderers and sojourners among the letters. This condition of things in human society would convert it into a mass of paupers and criminals. In the republic of letters the results are also depraving. Between letters and sounds there are no acknowledged rights of *meum* and *tuum*; the homeless sounds have to steal a shelter as best they may, now here, now there, among the letters; and the letters have to share their quarters, willy-nilly, with strange interlopers. In plain language, the alphabet is so extremely defective that it *cannot*, without amendment, adequately represent our speech.

How is this necessary amendment to be effected? Here irreconcilable discord arises between words. Each word claims its customary appropriation of letters, and—possession being nine points of the law—each resolutely holds to what it has. "I should not be known in any other dress," says word after word. One adds, "I came from France with the Conqueror;" another, "I hail from classic Rome;" a third, "I boast of Anglo-Saxon origin;" a fourth, "and I of sacred Eastern origin." "I am from Ireland," "I from Wales," say others. Danes, Swedes, and Dutch, Arabians, Spaniards, Greeks, and a host more, assert their claims; and each word points with pride to some poor ragged vestige of old national costume supposed to be distinguishable in its orthography.

But all this attempting to record the nationality of words in spelling has nothing to do with the requirements of popular writing. The spoken *sound*, and not the written sign, is the real word;

and only the sound, and not the verbal genealogy, calls for representation. The derivation of words belongs to etymology, and not to orthography.

Our defective alphabet, and the consequent irregularity in spelling, form the only obstacle to the international diffusion of English. This obstacle may be removed for international purposes without disturbing our own spelling. I now refer for a moment to the system of letters denominated 'World-English,' in which a distinctive character is furnished for each sound in the language. By this means the orthography of every syllable becomes absolutely regular. A large proportion of the common alphabet is retained unchanged in World-English, but each letter is limited to the expression of one single sound. New letters are, of course, introduced for unrepresented sounds, and these are designed to resemble old letters as much as possible. The effect is, that any reader of ordinary English deciphers World-English without the slightest difficulty. At the same time — the writing being perfectly phonetic — the exact pronunciation of every word is indicated in the spelling.

I need not say any thing more concerning World-English, except in reference to certain prevailing misconceptions as to the scope and object of the system. Some critics have looked on the new orthography as only a fresh attempt at spelling-reform; and they argue, that, as the new letters are not to be found in every printing-office, the introduction of the system must needs be hopeless. This view is entirely a misconception. World-English does not interfere in any way with ordinary spelling. The object is simply to provide a separate method of learning to read and speak the language, for the benefit chiefly of students in foreign countries, but incidentally also as a help to beginners at home. Books, magazines, and newspapers do not require to use a single one of the new letters.

Other critics have objected to the association of English sounds with the vowel-letters *a, e, i*, as giving a preference, they say, to narrow usage over the wide usage of Continental Europe, which would require these letters to be sounded *ah, ā, ee*. This is another misapprehension of the system. The World-English alphabet is not — like that of Visible Speech — a universal alphabet. Its exclusive object is to teach ONE language, and to do so with as perfect conservation as possible of the phonetics of ordinary letters. To have associated the sounds *ah, ā, ee*, with the letters *a, e, i*, would have defeated the very purpose of the scheme. World-English does not assimilate English to other tongues, but only facilitates the acquisition of the language, exactly as it is spoken in England and America.

My allotted space does not permit me to say more. I trust, however, that this brief statement will have sufficiently established the claims of English to universality. I have confined my remarks to this single point. If the language were merely as well adapted as any other for international use, its being the native tongue of the two greatest nations on earth should decide the question of its superiority for social, commercial, and scientific intercourse throughout the world.

Volapük, Lingua, and other schemes proposed for universal language, will, I fear, prove but wasted efforts. The field is occupied. Every zone is being covered with broad growths of world-over-spreading English. Let us improve, while we may, what none can supplant, and none need wish supplanted. World-English has performed one not unimportant service, in showing how established spelling may be preserved, while the orthographic obstacles are removed that have hindered both the diffusion of the language, and its *recognition*, as the most fit medium for international communication universally.

HEALTH MATTERS.

The Pollution of Water-Supplies.

DR. CHARLES SMART, surgeon U.S.A., presented a report at the recent meeting of the American Public Health Association on the pollution of water-supplies.

The report gives special emphasis to the conclusion reached at the previous meeting, that, when there is sewage in a water-supply,

there is danger of typhoid infection. Some of the evidence is briefly cited; and the financial interests involved are held responsible for the hesitancy to acknowledge this specific danger, for as soon as a city relieves itself from the oppression of the moneyed interests, and procures a wholesome water for its citizens, it immediately recognizes the connection between sewage and typhoid. Vienna recognized this connection when it found, that, by substituting the water of a mountain-stream for the sewage-water of the Danube, its annual deaths from typhoid fell from three hundred and forty to fifty, and shortly afterwards to eleven, in every hundred thousand of the population; and an improved sewerage system had nothing to do with this, as the sewerage system was in existence during the period of high typhoid rates.

The efforts made by municipal authorities and water companies are then passed in review. The advantages of sedimentation, which is the method generally adopted in this country, are recognized, and particularly when sedimentation is promoted by the use of precipitants, such as chloride of iron, as recently suggested by L. H. Gardner of New Orleans, La. The changes that take place during storage are held to be purifying in their nature, notwithstanding the vast increase in the number of bacteria developed in the stored waters. The slowness of the sedimenting process, often necessitating a large expenditure for storage-basins, has led to the experimental use of such filtering-beds as are employed so generally for municipal supplies in England; but the expense attending them is large, and the coldness of our winters begets difficulties which are not encountered in the milder climate of England. Attention is then directed to the patent filters that have of late been manufactured for use on a large scale. Their ability to furnish a clear water is conceded; but the object of the filtration of a water-supply for domestic or public service is its wholesomeness when used for drinking, and its transparency gives no testimony on this point. Artificial filtration has neither the time nor the surface to effect percolation after nature's methods. In these artificial filters, as much water is transmitted under pressure in half an hour as nature purifies on the same area annually. Bacteria of nitrification, which effect the purification during the passage of a water through the soil, cannot be harnessed to the work of the artificial filter. Artificial filtration consists of the mechanical separation of a water from its suspended impurities, while the essential of natural filtration is the thorough nitrification of the dissolved albuminoids of the water, the removal of the suspended matters being incidental and merely secondary.

But although sedimentation and filtration give a more or less clear water, and one in which the organic matters that are prone to decompose are destroyed and rendered harmless by bacterial agencies, if an infected sewage has entered the water, the living germs of typhoid-fever are not removed or deprived of their virulence by any of these modes of purification. The infected water which prostrated twelve hundred of the eight thousand inhabitants of Plymouth, Penn., and killed a hundred and thirty of those whom it prostrated, passed through three storage-reservoirs on its way to accomplish its deadly mission; and the springs of Lauzun, in Switzerland, contained the germs and propagated the disease, although their waters had undergone a thorough filtration. From the particulars of the latter epidemic, it is held, that, while sewage irrigation may give effluents that will preserve our streams from becoming open sewers, it will never furnish a water which can be afterwards used as a drinking-supply.

The conclusion reached is an emphasized reiteration of that of every committee which has investigated this subject, — that a water to which sewage has had access should, from that fact alone, be excluded from all further consideration as a possible water-supply for domestic purposes. Money is held to be all that is wanting to solve the question of pure water-supplies. Engineering difficulties fall into insignificance when surveyed from a satisfactory financial standpoint. It is often said to be beyond the power of money to purchase health, but the sanitary student can readily demonstrate that in many cases this is not so. Money expended in the distribution of a wholesome water-supply will purchase health for the thousands who otherwise fall victims to the fever which is endemic in our cities and towns. Typhoid-fever is a disease to which every one is exposed. The susceptibility to it is inherent in our consti-

tution, and, so far as we know, immunity can be purchased only by submitting to attack. We are surrounded by its infection, and cannot escape. Ordinarily the human constitution succumbs to its influence before maturity is reached; but if, up to that period, we fortunately escape, we have no assurance of future immunity. Uncertainty overhangs us like a cloud. Danger is as present with us in the daily routine of our peaceful lives as on the battle-field, only that the embodiment of evil is an invisible and intangible germ instead of a fast-flying bullet. Danger flows beside us in our streams, in our mains, from the taps in our houses. The germ of disease may not be in this pitcherful or in that, in this tumblerful or in that, but it will find us some day if we continue to use the water which contains it. In a town of fifty thousand inhabitants, one victim is taken daily; and, as the average duration of this fever is about a month, there are always in that city thirty persons whose lives are unnecessarily trembling in the balance. What is the local suffering from yellow-fever in Jacksonville, Pensacola, or New Orleans, once in so many years, compared with the totality of the devastation caused by the steady progress of this general and ever-present scourge? Thirty thousand people die of typhoid-fever annually in the United States of America; and Vienna lowered her losses by this fever from three hundred and forty to eleven annually in every hundred thousand of her population by introducing a spring-water supply instead of the sewage-tainted waters of the Danube. Calculate the loss by sickness associated with these thirty thousand deaths, — the loss of work, the unprofitable work of nursing, and the actual outlay necessitated by each visitation of the disease, — and you will find that saving money by drinking sewage in the water-supply is a penny-wise policy, that, in the long-run, will fail to pay even for the funerals and mourning goods.

The importance of acting promptly is insisted upon, as, the longer a community procrastinates, the greater is the difficulty experienced in procuring a desirable supply of water, owing to the increasing density of the population of the surrounding country. Having obtained a pure supply, every square foot of the drainage area should be familiar to the sanitary inspector, that the life and health of the citizen may not be endangered by that which was intended as a benefit. Every case of typhoid-fever occurring on such an area should be specially watched, and the infection of the dejecta destroyed. But as the efforts of local authorities, such as water companies and boards, citizens' committees, health boards and commissioners, would often be powerless without the intervention of the authorities of the State, a livelier interest in this important matter is urged on the part of the State boards of health, — an interest which is not satisfied with discussing and subscribing to views of the subject, but which will leave nothing undone that will tend to invest them with power to act for the preservation of the public health. With all our boards operating, each within its domain, there would be no need of committees to investigate the subject of water-pollution.

The report concludes with a resolution that will tend to strengthen the hands of the State boards, — that it is the well-considered belief of the American Public Health Association that great good would accrue to the public health, particularly in the denser settlements, if State legislatures would give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water-supplies, investing them with the supervision of the said supplies, and with power to preserve them from contamination by sewage or other injurious matters.

BOOK-REVIEWS.

The Young Idea; or, Common-School Culture. By CAROLINE B. LEROW. New York, Cassell.

THE lady who has with much labor compiled this little book has done a genuine service to the cause of educational reform: for she has pierced the shams of the present curriculum with the shafts of ridicule, and so reached many readers who would have paid no attention to a more formal argument. In 'English as She is taught,' the same writer attacked one branch of instruction: in the present book she attacks the vicious principle that runs through the teaching of all the branches. That she has worked to some

purpose is testified by the sneers of *Education*, an ardent defender of every thing that is worn out; for, argument in reply failing, some harsh expletives and ill-timed jibes were resorted to by that antiquated periodical in order to break the force of Mrs. LeRow's indictment.

It would be a serious mistake to suppose that Mrs. LeRow's object is to amuse, though her book contains many amusing things. "Repugnant, one who repugs," is the natural answer of a boy who has been taught what the schoolmasters are pleased to call etymology, by the mechanical method. As the author suggests, the child who defined arithmetic as the "sins of numbers" had an almost supernatural insight into the difference between the way in which he was being taught and the way in which he should be taught. And the following is too good to pass unnoticed (we will all agree with Mrs. LeRow that it would have rejoiced Lord Byron's heart): "A critic is something to put your feet on to." The self-evidence of this will also be appreciated by all but the book-writers and book-publishers: "Grammar is something to talk good, and is divided into digrams on the blackboard. I cant never learn to do grammar." "The Saxon Cronical was the seven deadly sins," is a sufficiently startling statement to indicate that bad teaching is not confined to the lower grades: it seems to reach at least to the history classes.

These quotations might be multiplied at great length, but to cite too many of them would perhaps emphasize too much the merely illustrative side of Mrs. LeRow's work. She is not jesting: she is in sober earnest. She knows of what she writes. She has been in the schools, and seen and heard what she speaks of. She has a gospel to preach. It is a protest against educational indifference, a call to the study and criticism of educational methods. To remedy these defects and bring about the necessary reforms, many things are necessary. Politicians and time-servers must be ejected from the school-boards; inefficient and mechanical superintendents and principals must be retired; and raw, untrained, and immature girls, yet in their teens, must no longer be given an opportunity to dull and stupefy thousands of child-minds under the protection and in the service of the State. Until public opinion is aroused, no one of these steps can be taken, and Mrs. LeRow should be loyally aided and encouraged in her self-imposed task of arousing public opinion.

Hand-Book of Historical and Geographical Phthisiology, with Special Reference to the Distribution of Consumption in the United States. By GEORGE A. EVANS, M.D. New York, Appleton. 12°. \$2.

IN this volume Dr. Evans has given us a sketch of the development of our knowledge of pulmonary consumption from the time of Hippocrates to the present day, together with the ascertained facts regarding the geographical distribution of that affection. In addition to this, he has arranged the statistics in regard to this distribution in the United States so as to make them available for convenient reference in selecting localities of resort or residence for invalids, and also for those who are in health. He coincides with Hirsch in designating consumption as a ubiquitous disease, extending over every part of the habitable globe. Taking the mean death-rate of the whole of a population to be twenty-two per thousand, the average of deaths from phthisis would be nearly one-seventh of the whole mortality, or three per thousand, of the population. Estimating the total yearly mortality of the world to be thirty-five million, five million of these deaths are attributable to consumption, — the greatest number caused by any single disease.

The consideration of the geographical distribution of consumption in the United States is based on the 'United States Census of 1880,' and Rand & McNally's 'Atlas of 1887.' The same is true of those portions of the book which treat of the topography and climate of States, and of the number of deaths from consumption in the different States and cities. The etiology of the disease is discussed at length, and the views of Hirsch, Hunter, Lindsay, Bowditch, Elliott, Hermann, Müller, Koch, and others, are referred to.

Concerning the conclusions which may be deduced from the evidence submitted in regard to the geographical distribution of phthisis, Dr. Evans says that he can do no better than to quote the

following brief summary from Hirsch: "Phthisis is everywhere prevalent, but is rare in polar regions, and rarer still at great altitudes. The main factor in its production is overcrowding and bad hygiene. Heat and cold, *per se*, have no influence. Damp, when conjoined with frequent oscillations of temperature, predisposes to the disease; but humidity of the air is less important than dampness of the soil. Occupation is extremely important, but mainly indirectly, as tending to good or bad hygienic conditions." With reference to the part played by the tubercle bacillus, Dr. Evans says it is reasonable to believe that it holds the same etiological relation to pulmonary phthisis that certain other micro-organisms hold to external surgical affections, to septic diseases of the (post-partum) uterus or its contiguous tissues, etc. He thinks that there can be no doubt that pulmonary phthisis occasionally terminates in recovery, and refers to cases reported by competent observers in which such a result has followed. He believes that the respiration of antiseptic air by phthisical subjects will be found in the future to be as successful in the treatment of consumption as topical antiseptic influences have been in the treatment of external surgical affections.

Although Dr. Evans states in the preface that his treatise is made up, to a great extent, of the observations of others, and for the most part in their own words, still he deserves great credit for the admirable manner in which he has arranged the material, and for the excellent judgment displayed in selecting from the writings of others all that is most valuable, and pertinent to the subject.

The Story of Holland. By JAMES E. THOROLD ROGERS. New York, Putnam. 12°.

THIS book, the last in the Story of the Nations Series, is in some respects an admirable work. The author's conception of history, and his view of what is important in human affairs, are excellent. In particular, he gives but small space to those military operations which are the main element in most popular histories, and confines himself to the far more essential movements of political, intellectual, and commercial life. He conceives very clearly and correctly the part played by Holland in the history of modern Europe, though we think he overrates its importance. He declares that "the resistance made by Holland to the Spanish king was infinitely more heroic, far more desperate, much more successful, and infinitely more significant," than that made by the Greeks against the Persians; and this is surely a gross exaggeration. The Greeks were the founders of civilization, and its very existence depended on the success of their struggle, and this cannot be said of the Dutch war or any other in history. Nevertheless the great importance of the Dutch contest is undeniable, not merely as affecting Holland itself, but even more in its influence on the politics of Europe. For two centuries the little republic was one of the chief centres of European life; and Mr. Rogers shows clearly how intimately her prosperity was connected with that of the great nations around her. The war of independence necessarily occupies the chief place in the story; but the decline of her freedom, and her influence, are also narrated, and the causes of the same are made plain.

With the general conception of Mr. Rogers's work, then, there is little fault to find; but we cannot say the same of the execution. The author seems to assume that his readers are already familiar with the history of England and the general history of Europe; for he perpetually alludes to events outside of Holland which no one not thus informed can possibly understand. The worst example of this is in the thirty-third chapter, which treats of the war of the Spanish succession. The author does not announce his subject at all, but begins by making indirect allusions to it; and nowhere in the chapter is there any clear statement of what the war was about. In the same chapter Marlborough is frequently alluded to, and always by that name, and then all at once he is spoken of as John Churchill. But there is also a still worse defect in the book: it is full of grammatical blunders and other mistakes of language, the most frequent being the disagreement of the verb with its subject. Thus, we read that "piracy and buccaneering was practised;" that "scenes like those of 1672 was threatened;" and that "the spirits of the Dutch was a little raised." So the author says of a certain Englishman that he "learnt all his learning from Dutch sources," and elsewhere alludes to certain bad harvests as "even

more disastrous in France than they even were in England." Such blunders occur at frequent intervals throughout the book, and seriously detract from its merit.

Patriotic Reader; or, Human Liberty Developed. By HENRY B. CARRINGTON. Philadelphia, Lippincott. 8°.

THIS book is a collection of extracts from various writers and speakers, expressing the sentiment of patriotism, and intended to cultivate that sentiment in the mind of the reader. The authors are mostly American, and the passages given are on various topics, such as the lives and character of eminent men, the deeds of heroes, the blessings of liberty, the future of America, and other themes on which our popular writers and orators are fond of desecrating. One chapter consists entirely of "Patriotic and National Hymns, Songs, and Odes," while the rest of the book is mainly prose. Many of the passages given are excellent, but we confess that in the book as a whole there is altogether too much hifalutin and self-glorification to suit our taste. This constant boasting of our country and her institutions is both disagreeable and mischievous, as tending to develop national conceit. Our political organization and our fundamental laws are indeed excellent, but our civilization as a whole is by no means high; and it behooves us to think of our deficiencies and try to remedy them rather than to be perpetually glorying in the liberty our fathers gave us. The compiler of this book, however, seems unaware that we have any deficiencies, and therefore the most important duties of the patriot at the present day cannot be learned from his pages.

The Economic Interpretation of History. By JAMES E. THOROLD ROGERS. New York, Putnam. 8°.

PROF. MICHAEL FOSTER has spoken, in a recent paper, of the possibility that in the future the sciences of morphology and physiology may come together again, because of the interdependence of their subject-matters, form, and function, just as the growing specialization of science started them on different lines in the not very remote past. The same thing is true, in a most interesting and suggestive sense, of history and economics. The former is the morphology of society, and the latter its physiology; and, while they have been far apart in the past, they are clearly approaching each other at present. The so-called 'historical' school of economists, and the so-called 'historical' method in economic science, are evidence of this; and Prof. Thorold Rogers, in the Oxford lectures which constitute the book before us, has done something to make the community of the historical and economic fields intelligible. The writer's elaborate researches into the condition of labor and wages in England for the past six hundred years, have made possible — perhaps suggested — the present volume.

The keynote of the book is struck in the following passage from the preface: "The distrust in ordinary political economy has been loudly expressed by workingmen. The labor question has been discussed by many economists with a haughty loftiness which is very irritating. The economist, it is true, informs them that all wealth is the product of labor, that wealth is labor stored in desirable objects, that capital is the result of saved labor, and is being extended and multiplied by the energies of labor. Then he turns round and rates these workmen for their improvidence, their recklessness, their incontinence in foolishly increasing their numbers, and hints that we should all be better off if they left us in their thousands, while there are many thousands of well-off people whose absence from us would be a vast gain. I have never read, in any of the numerous historical works which political economists have written, any attempt to trace the historical causes of this painful spectacle, or to discover whether or no persistent wrong-doing has not been the cause of English pauperism. . . . My treatment of my subject, then, is as follows. You have a number of social or economical facts, many of them containing problems of a serious and urgent character. So serious are they, that many persons — an increasingly large number of persons — demand, if no other solution is to be given, that society must be constructed on new lines, as Frankenstein made his man, or monster. To meet these people with the law of supply and demand, to point out to them the bliss of unrestricted competition, and to rebuke them with the Malthusian law of population, the Ricardian theory of rent, and the margin of unproductive cultivation, is to

present them with logomachies which they resent. . . . Many of the problems which vex society have an historical origin, sometimes a present cause, though more rarely. Now, I have made it my business in these lectures . . . to examine into and expound the history of social facts." Professor Rogers does not fail to express himself as to the folly and shortsightedness of purely speculative economics. Passages where his opinion concerning such treatment of his science is freely made known abound in these pages. One of the cleverest and most timely is this: "Perhaps the most remarkable Nemesis which has come on the speculative economist is that the definition of Population by Malthus, and the definition of Rent by Ricardo, have been made the keystone to Mr. Henry George's theory, under which he demands the confiscation of Rent in the interests of Population."

The close connection between the rise and power of the great cities of Germany and Italy, and the development of transcontinental commerce, we all know about. We are not so clear, however, about the historical causes of early English labor legislation, of the rise of the various forms of tenancy, and of ship-money; or about the economic effects of the guilds, the apprentice system,

French Painting.' The book is compact with biographical and other statistical details, and has an account of the fostering of art by the State, which in France has always played so large a part in æsthetic development. An account is given of the French Academy of Painting, with its *salons*, schools of instruction, etc.; and not only the masterpieces of French painting, but all works of either individual interest or historical importance, are critically described, and their location in public and private galleries is pointed out. It is useful as a book of reference and for general reading. The paintings which have been reproduced include Meissonier, Millet, Troyon, Bouguereau, Watteau, Gérôme, David, Poussin, Daubigny, Bastien-Lepage, etc.

— *The Popular Science Monthly* for last July contained an article on house-drainage, which excited much interest and criticism. This vital subject will be further treated from various points of view in the January *Monthly*, in an illustrated article by Dr. John S. Billings, U.S.A., who is an acknowledged authority on sanitary science. Among other articles, we note 'The Guiding-Needle on an Iron Ship,' by Lieut.-Commander T. A. Lyons; and 'Science



From 'A History of French Painting.'

THE THREE MUSES.

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and the income-tax. On all of these subjects Professor Rogers writes clearly and learnedly.

The valuable chapter on the origin and history of *laissez faire* is, in our judgment, one of the very best in the book. We should go a step beyond Professor Rogers in criticising that principle and pointing out its inherent fallacies; but his very conservatism on this subject, and the measured force of his words, will carry greater weight with his *laissez-faire* countrymen than would an analysis of a more radical and far-reaching character. We lay the book down with the feeling that in reading it we have obtained a clearer insight both into the economic facts of the past and into the economic science of the future.

AMONG THE PUBLISHERS.

MODERN art has been so largely and so directly influenced by the French schools of painting, that a new work which analyzes and traces to its source this influence will be sure of a hearty welcome. The comprehensiveness of Mrs. Stranahan's 'A History of French Painting' (New York, Scribner) is its distinctive feature. More than any other national art except Italian, and more than any other modern art whatever, the course of French painting has been an evolution. Each school has clearly arisen out of national æsthetic conditions, and each one has legitimately developed its successor. No work, of the same general kind even, so distinctly presents this scientific historical interest as does this 'History of

and its Accusers,' by W. D. Le Sueur. In the same number Mr. E. R. Shaw will tell how he made geometry a pleasure to his pupils, using the 'Inventional Geometry' prepared by Herbert Spencer's father.

— The November number of the *American Meteorological Journal*, Ann Arbor, Mich., contains articles on 'The Influence of Forests upon the Rainfall and the Flow of Streams,' by Prof. George F. Swain, of the Massachusetts Institute of Technology; on 'Tornadoes,' by Dr. Gustavus Hinrichs, director of the Iowa Weather Service; and on 'Diurnal Cloud and Wind Periods, at Blue Hill Observatory during 1887,' by H. H. Clayton; etc.

— A. B. Ward, the author of 'Hospital Life,' in a recent issue of *Scribner's*, will contribute to the January number 'The Invalid's World,' which includes the doctor, nurse, and visitor. It is now known that 'A.B. Ward' is the pen-name of a woman. Dr. George P. Fisher of Yale will write regarding the amenities which should be observed in all respectable controversies, but which are generally violated. In General Alexander's article on 'Railway Management,' the mystery of making time-tables will be explained. Ex-Postmaster-General Thomas L. James will contribute an article on 'The Railway Postal Service,' and W. C. Brownell's group of essays on 'French Traits' will be continued. The Right Rev. Henry C. Potter, bishop of New York, will contribute the final paper to *Scribner's Magazine* for February. It is in the series by eminent men, which replaces Mr. Stevenson's monthly essays.

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for December, published to-day, gives for 25 cents as much and a better quality of literature than can be bought in any other form for a like sum. DONN PIATT, the Editor, is seriously philosophical on "The Late Election," "The Balance of Trade," "A Plea for the Parent," and "About the Ballot." Circumstances affect even great editors. Had the DEMOCRATS won, the editorials might have been different. Nevertheless, they are mighty good reading—sarcastic, bright, humorous, and pertinent. MR. A. L. KINKEAD supplies the long novel. It is American anyway, and though not as dull and ponderous as ROBERT ELMERE, is far more pleasing, and therefore, a better story, being overflowing with love-making, incidents and action, and the plot is sufficiently complicated and mysterious. The celebrated comedian, WM. J. FLORANCE, tells a story "About Dead-Shot Dan." It is as humorous and unique as anything MARK TWAIN ever did. CELIA LOGAN'S story, "A Christmas Round Robin," reads like a chapter from PICKWICK PAPERS. "Christmas in Egypt" is ROSE EYTINGE'S contribution, it is like herself, bright and clever. The two weighty articles are ETHELBERT STEWART'S "Statistics of Idleness," and "Certain Ancestors of PRESIDENT CLEVELAND." A story of frontier life, "Joe," by ROSALIE KAUFMAN, is not inferior to any of BRET HARTE'S. The poetry is furnished by Helen G. Smith, W. H. Hall, Thomas Hubbard, Joel Smith, and W. E. S. Fales, and it is all poetry too. But the tid-bit in this galaxy of good things is JAMES STEEL'S essay on "The American Eagle Under Difficulties." It is as original and funny as CHARLES LAMB'S on Suckling Pig.

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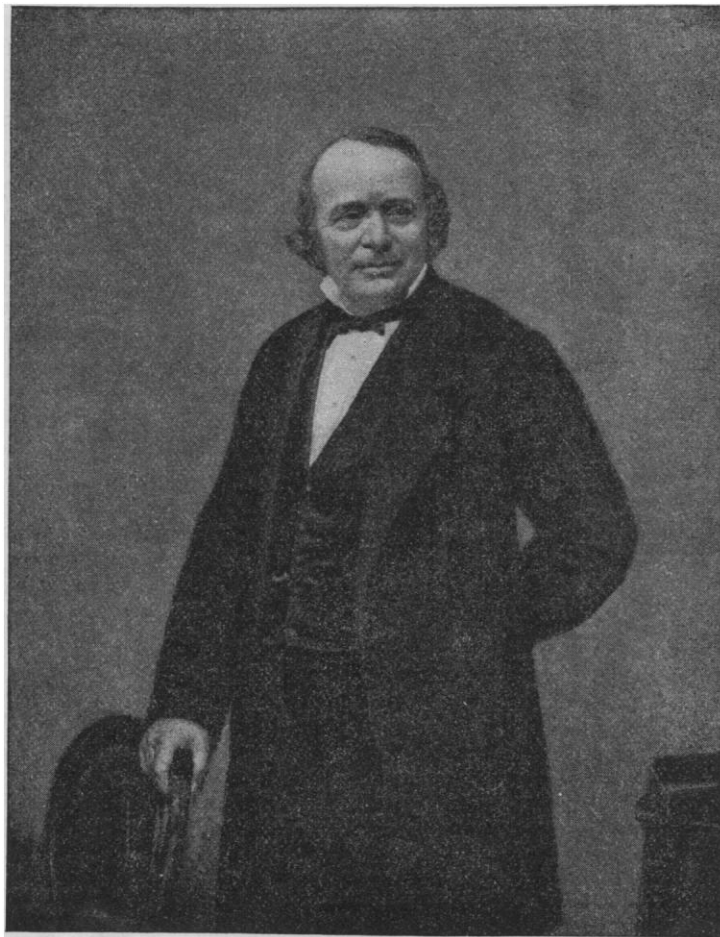
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— Instead of enlarging the *Writer* and increasing its price, as its publisher had planned, he will publish a companion monthly, to be called the *Author*. The first number is promised Jan. 1, and will contain selected and original matter of special importance to writers.

— For young people, the 'Children's Stories of the Great Scientists,' by Henrietta Christian Wright (New York, Scribner), equals in interest the author's two previous books, which have attained popularity as supplementary readers. It deals, in a simple, entertaining manner, with sixteen of the great men of science, giving a brief, readable account of their lives and of what discoveries they made. The narratives are fresh and animated, having that graphic picturesqueness which is rarely found in the treatment of such topics. The portraits of Galileo, Newton, Franklin,

Parsons. They will publish on the 14th, in their popular Young People Series, another volume by Kirk Munroe, entitled 'Crystal Jack & Co.,' but which also includes a shorter story, 'Delta Bixby;' Mr. Howells's new novel, 'Annie Kilburn;' and Walter Besant's 'All Sorts and Conditions of Men.'

— The committee on publication of the Grolier Club, New York, announces in *The Publishers' Weekly* of Dec. 8, that, owing to unavoidable delays in the editing, and in the preparation of suitable type and engraved ornaments, it has been impossible to issue, as early as anticipated, the long-promised new edition of the 'Philobiblon.' This work, it may be interesting to note, was written by Richardus d'Aungerville, an English prelate, called also Richard de Bury, who was born at Bury St. Edmunds, in Suffolk, in 1281. He was educated at the University of Oxford, and entered the order of



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— D. Appleton & Co. have now ready 'The Household History of the United States and its People, for Young Americans,' by Edward Eggleston. A school edition of this work was published last September.

— "The book of the week," says G. W. Smalley in the *Tribune* for Dec. 2, is "Earl Stanhope's 'Notes of Conversations with the Duke of Wellington.' This little volume abounds in anecdotes of the most interesting kind; interesting, above all, as giving the duke's opinions in his own words on people and events in his own time."

— Harper & Brothers published last week the handsomely bound book of 'Old Songs,' illustrated by Edwin A. Abbey and Alfred

Benedictine monks. On the accession to the throne of Edward III., whose instructor he had been, he was promoted to various offices of dignity, and was finally made bishop of Durham, as well as lord high chancellor and treasurer of England. At Oxford he founded a library for the use of the students, which he furnished with the best collection of books then in England; and for the keepers of this library he wrote the 'Philobiblon,' which contains directions for the management of the library, and an elaborate eulogy of learning, and the most charming treatise on the love of books, in Monkish Latin, which was first printed at Cologne, 1473, then at Spire, 1483, and finally at Oxford, 1599. In his researches abroad, Professor West of Princeton discovered in the various public libraries of Europe a number of early manuscripts of the 'Philobiblon,' and has made an exhaustive study and collation of these, adopting the reading which, upon comparison, seemed to him authentic. The result, it is hoped, has been the production of a text and translation which will probably hereafter be considered as the

only true and genuine edition of Richard de Bury's treatise. All the early printed editions, without exception, have been found full of errors, and the translations based upon them are of course incorrect. The new book will be furnished to subscribers as soon as it can be properly done, about April 1, 1889. Subscriptions will be received up to the 10th of January next, when the lists will be closed, and the printing proceeded with without delay.

— *The Atlantic Monthly* for 1889 (published by Houghton, Mifflin, & Co.) will contain in addition to the short stories, essays, sketches, poetry, and criticism, three serial stories, — 'The Tragic Muse,' by Henry James; 'The Begum's Daughter,' by Edward L. Bynner; and 'Passe Rose,' by Arthur Sherburne Hardy (this story began in the September number, and will continue until April). American subjects will be discussed by Mr. John Fiske, whose articles on these topics are equally thoughtful and engaging. Several novelettes, in two and three parts, will appear during the year. From time to time *The Atlantic* has contained important papers on topics relating to education, by men of large experience and of exceptional ability to discuss educational principles and methods. It will contain similar papers in the future, as important questions shall arise; also occasional poems by John G. Whittier, essays and poems by Oliver Wendell Holmes, occasional papers and poems by James Russell Lowell, and several poems by Thomas Bailey Aldrich. Contributions during the year 1889 may be expected from John G. Whittier, Oliver Wendell Holmes, James Russell Lowell, Francis Parkman, Charles Eliot Norton, T. W. Parsons, Thomas Wentworth Higginson, P. G. Hamerton, Charles Dudley Warner, E. C. Stedman, F. Marion Crawford, Harriet W. Preston, Sarah Orne Jewett, 'Charles Egbert Craddock,' Mrs. L. C. Wyman, Edith M. Thomas, Horace E. Scudder, J. P. Quincy, George E. Woodberry, Herbert Tuttle, William C. Lawton, George Frederic Parsons, Maurice Thompson, Lucy Larcom, Celia Thaxter, Julia C. R. Dorr, Agnes Repplier, Olive Thorne Miller, Bradford Torrey, Percival Lowell, Octave Thanet, Margaret Deland, and many others. *The Andover Review* (published by the same firm) is a religious and theological review, under the editorial control of Professors Smyth, Tucker, Churchill, Harris, and Hincks, of the Andover Theological Seminary. The November and December (1888) numbers of both magazines will be sent free of charge to new subscribers for 1889 whose subscriptions are received before Dec. 20. Houghton, Mifflin, & Co. publish also *The Journal of American Folk-Lore*, a quarterly magazine, each number containing about ninety-six pages, octavo, edited by Dr. Franz Boas of New York; Prof. T. F. Crane of Cornell University; the Rev. J. Owen Dorsey of the Bureau of Ethnology, Washington, D.C.; and Mr. W. W. Newell of Cambridge, Mass., general editor.

LETTERS TO THE EDITOR.

*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Twenty copies of the number containing his communication will be furnished free to any correspondent on request.

The editor will be glad to publish any queries consonant with the character of the journal.

The Moon's Light for Geodetic Signals. — Electric Storms on High Peaks in Nevada and Utah.

TRIALS of the moon's light with a view of determining its effectiveness for signals in the primary triangulation of the Coast and Geodetic Survey were undertaken by William Eimbeck, assistant in the survey, in 1883, at Pioche station, Nevada. The results obtained over a line of twenty-two miles in length were sufficiently promising to warrant a resumption of the experiments over longer lines.

In 1887 the occupation of Mount Nebo — a station of the transcontinental triangulation in central Utah, at an elevation of twelve thousand feet above sea-level — afforded the desired opportunity. At three of the stations of the triangulation connecting with Mount Nebo the heliotropers were duly instructed to show the moon's light for two hours continuously between the 29th of June and the 4th of July, the moon's age between these dates ranging from first quarter to full moon. They were to begin during twilight, or about forty-five minutes after sunset, and to substitute for their heliotrope-mirrors reflectors of extra size, proportioned to the length of the

respective lines of sight. These were forty-eight statute miles to Draper, seventy to Onaqui, and ninety-seven to Ogden; and the diameter of the mirrors ranged from six to eight inches at Draper, eight to ten inches at Onaqui, and twelve to eighteen inches at Ogden.

The atmospheric conditions proved unfavorable, high winds, a murky atmosphere, and a decidedly hazy sky prevailing, except upon the nights of the 2d and 3d of July, when the lights from the selenotropes at Draper and Onaqui were plainly visible in the illuminated field of the telescope. Distinctness and steadiness were the most striking characteristics of these signals. They shone as mere dots of white light, and, for precise pointing, were of ideal perfection. The light at Ogden was not seen.

Mr. Eimbeck's conclusion from these trials is, that during a period of from twelve to fifteen days in each lunation the moon's light can be used to much advantage for geodetic signals in the altitudes of the arid regions of the interior, upon lines trending in all directions, if they do not exceed about fifty miles in length.

Referring to the electric thunder-storms that prevail in the high mountains of Nevada and Utah during July and August, and not unfrequently hover about the King Peaks for days in succession, Mr. Eimbeck observes that these storms are at times very severe, and not without danger. They were especially so towards the close of the occupation of Mount Nebo in July, and also at Tushar and Jeff Davis Peaks, lasting for over seven days. The violence of the electric exhibitions, and the almost constant detonations of the discharges of electricity, were so grand and overpowering that the parties of heliotropers stationed at Tushar and Jeff Davis Peak abandoned their stations in alarm for their lives. Those at Tushar returned after the storm had abated, but those who had been at Jeff Davis Peak (13,100 feet in height) refused.

The effect of these storms upon experienced officers of the survey is to produce a great strain upon the nervous system, and the sudden fall of temperature with which they are attended is a source of much physical discomfort. With the mercury almost down to freezing-point and an atmosphere of moist iciness, the body becomes benumbed, and the mind sluggish. There is also the apprehension, not without reason, of instant death by lightning. The summit of one of the peaks was often struck, and also the tent occupied by the men, but fortunately at a time when no one was in it.

EDWARD GOODFELLOW.

Washington, D.C., Dec. 5.

Answers.

40. FELSPAR, OR FELDSPAR? — This mineral name seems to have been first used by Wallerius in 1747, in his 'Mineralogia,' in the form 'felt-spat,' meaning field-spar. The early German form was 'feld-spath.' In the appendix to the English translation of Cronstedt's 'Mineralogy' (p. 8) we have it 'field-spar.' In Edwards's 'Fossilogy,' 1776, we have (p. 54) 'felspat,' going back to the Swedish form. Kirwan, in 1784, 'Mineralogy' (p. 124), has the form 'felt-spar.' In the second edition of his 'Mineralogy,' however (1794, vol. i. p. 317), Kirwan has the following note: "This name seems to me derived from *fels* ('a rock'), it being commonly found in granites, and not from *feld* ('a field'); and hence I write it thus, 'felspar.'" This unwarrantable assumption of Kirwan was followed by later writers, and so the corruption came into use. In Schmeisser's 'Mineralogy' (1795, vol. i. p. 131) we have only 'feldspar.' Jameson (1804, vol. i. p. 275) says 'felspar,' but in a footnote, "More properly 'feldspar.'" Phillips, in his first edition, gives both derivations, i.e., from *feld* and *fels*, but in the later editions only from the former. Cleaveland (1822) uses 'feldspar,' while Thomson (in 1836) says 'felspar.' In Dana's 'Mineralogy' (fifth edition, 1868, p. 352) we find, "Feldspath, *Germ.*; feldspar, *Engl.*; felspar, *bad orthogr.*" Webster's, Worcester's, Stormouth's, and Skeat's Dictionaries derive the word from '*feld*spath,' though both spellings are given. It is clear, therefore, that the original word was 'feldspar,' and that 'felspar' is a corruption from a mistaken idea of its origin. But the latter has been used so much, and for so long, that it has its place in the language, and no one who prefers it can be criticised for using it.

ALBERT H. CHESTER.

Hamilton College, Clinton, N.Y., Dec. 10.

Publications received at Editor's Office, Nov. 19-
Dec. 1.

- ALASKA, Report of an Expedition to the Copper, Tanana, and Koyukuk Rivers in the Territory of, in the Year 1885, made by Lieut. H. T. Allen. Washington, Government. 172 p. 80.
- ALLEN, I. F. The Characeae of America. Part I. Introduction, Morphology, and Classification. New York, 10 E. 36th St. 64 p. 80.
- BARTON, S. The Battle of the Swash and the Capture of Canada. New York, C. T. Dillingham. 131 p. 160. 50 cents.
- BAUER, G. Spelin. A Universal Language. Tr. by Charles T. Strauss. New York, Charles T. Strauss. 28 p. 120.
- BURT, B. C. A Brief History of Greek Philosophy. Boston, Ginn. 296 p. 120. \$1.25.
- CARRINGTON, H. B. Patriotic Reader. Philadelphia, Lippincott. 595 p. 120. \$1.20.
- CLARKE, J. M. Report on Bones of Mastodon or Elephas, found in Association with Human Relics in the village of Attica, Wyoming Co., N.Y. Albany, J. B. Lyon, Pr. 7 p. 80.
- CORY, C. B. Hypnotism or Mesmerism. Boston, Mudge. 61 p. 120.
- DAVENPORT, R. B. The Death-Blow to Spiritualism. New York, G. W. Dillingham. 247 p. 160. 50 cents.
- ERDE, Die. Lief. 36-40. Leipzig, Hartleben. f.
- ETHERIDGE, R. Fossils of the British Islands. Vol. I. Palaeozoic. Oxford, Clarendon Pr. 468 p. 40.
- FISKE, J. The Critical Period of American History, 1783-1789. Boston and New York, Houghton, Mifflin, & Co. 368 p. 120. \$2.
- GREELY, A. W. American Weather. New York, Dodd, Mead, & Co. 286 p. 120.
- Report on the Proceedings of the United States Expedition to Lady Franklin Bay, Grinnell Land. Vol. I. Washington, Government. 543 p. 40.
- HAZEN, H. A. Hand-Book of Meteorological Tables. Washington, The Author. 127 p. 80.
- HOLBROOK, M. L. Eating for Strength; or, Food and Diet in their Relation to Health and Work. New York, M. L. Holbrook & Co. 236 p. 120.
- KAY, D. Memory: What it is and How to Improve it. (Internat. Educ. Ser., Vol. VIII.) New York, Appleton. 334 p. 160.
- LANCIANI, R. Ancient Rome in the Light of Recent Discoveries. Boston and New York, Houghton, Mifflin, & Co. 329 p. 80. \$6.
- MACOUN, J. Catalogue of Canadian Plants. Part IV. Endogens. Montreal, Dawson Bros. 248 p. 80.
- MORAL and Scientific Companion. Vol. I. No. 1. Florence, Arizona. Eugene Arthur Browne. 4 p. f. 50 cents per year.
- NUTTALL, Zelia. Standard or Head-Dress? (Archaeol. and Ethn. I. Papers of Peabody Mus., Harv. Univ., Vol. I. No. 1.) Cambridge, Peabody Mus. 52 p. 80.
- PENNSYLVANIA Geological Survey. Atlas Eastern Middle Anthracite Field, Part II. Harrisburg, State. 80.
- PROCTOR, R. A. Old and New Astronomy. Parts VI. and VII. London and New York, Longmans, Green, & Co. 128 p. 80.
- KOGERS, J. E. T. The Story of Holland. New York, Putnam. 388 p. 120. \$1.50.
- SERVIS, G. P. Astronomy with an Opera-Glass. New York, Appleton. 154 p. 80. \$1.50.
- WALSH, W. S. Paradoxes of a Philistine. Philadelphia, Lippincott. 192 p. 160. \$1.
- WRITER'S Handbook, the. Philadelphia, Lippincott. 148 p. 120. \$2.50.

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